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Firefighters participate in a fire drill at a train in Seoul. Picture courtesy of Reuters/Lee Jae-Won (South Korea)

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Contents



19-23



25-29



31-37



41-44

05 NFPA Foreword

**06-16 News,
Product Profiles &
Viewpoints**

**19-23 Fire
Fighting Monitors -
Selecting the Right
One for your
Application**

**25-29 Effective
Fire System Warning
Devices**

**31-37 Fire Fighter
Protection - Is
Improved Wearer
Comfort A Trade-Off
Against Safety?**

**38-39 Extrication
Rescue Education**

**41-44 High
Pressure Water Mist
Improves Tunnel
Safety**

**47-51 ARFF
Vehicle Roundup**

**53-55 Placing
Fans for Optimum PPV
Effectiveness**

**57-60 ARFF Foams
Roundup**

**63-66 The Thermal
Imaging Camera - A
Look At The Past,
Present & Future**

**68-75 Distributor
& Representative
Office Listing**

**76 Advertisers'
Index**



47-51



53-55



57-60



63-66



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Foreword

NFPA codes and standards

By Theodore Lemoff

NFPA's Principal Gas Engineer

NFPA codes and standards are already being used in India in many areas including: suppression, detection, and emergency management; however in the last few years we have seen an increased interest for *hazardous material storage codes*. Building engineers, installers, architects, risk managers and the Fire Service have all expressed a need for NFPA scientific standards to be used in India together with the education in the use of these standards.

Last year, as NFPA's Principal Gas Engineer, I presented a seminar on Liquefied Natural Gas in Mumbai. The seminar was coordinated by a member of the NFPA LNG committee in India and sponsored by the Indian Chemical Council. Engineers in the energy industry and the Director of Explosives of India attended the seminar. During a previous visit to India I participated in a seminar on propane safety when propane import terminals were being proposed in India.

NFPA, which publishes 300 codes and standards used throughout the world, is the publisher NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas*. NFPA 59A is adopted by the U. S. Government, and used extensively in other countries as the standard to which LNG plants are built.

There has been a very high level of interest in LNG worldwide for the last few years. Liquefying natural gas provides a practical way to use natural gas found in countries with a small demand for the fuel. The liquefied gas can be economically shipped to countries that use natural gas. When used as a fuel, natural gas offers significant environmental advantages over liquid fuels and coal.

The use of liquefied natural gas is not new. The first commercial LNG plant was built in 1941. A number of export plants and import terminals were constructed in the 1960's, with the majority being in Asia. After a lull of about 30 years we are in the middle of a worldwide boom in interest in LNG. This boom in interest results from increased demand for the fuel in countries that have been importing LNG for several decades, new interest in LNG from countries such as India and China, and significantly increased interest in LNG imports into North America. As an example, in 2005 North America had four LNG import terminals. One has been added, and 44 others are being considered. While not all these will be built, it demonstrates that demand for natural gas in

North America will no longer be met by local production and limited imports, as it had been for many decades.

LNG terminal safety is of critical importance due to the very large quantities stored and the flammability of natural gas. The safety experience with LNG terminals worldwide up to this point has been excellent; however the potential for injury and death to neighbors, while low in probability, is significant. The only major LNG accident occurred in 1944 at the first LNG plant. A container failed, resulting in the spilling of about 4,000 m³ of LNG, a large fire, and over 100 fatalities. The lessons learned from the mistakes made in designing this plant have been applied to all subsequent LNG plants (demonstrating that with knowledge LNG can be a safe fuel alternative).

The seminar included a review of NFPA 59A that highlighted recent safety changes, a review of the regulations in the United States for permitting proposed LNG terminals, a "case study" following the process of permitting a proposed terminal in the State of Massachusetts, and a showing of the new film on LNG import terminal safety. Based on the interest in LNG in India, NFPA and the Indian Chemical Council are proposing an international LNG seminar in India later this year. The governments of India and the United States have indicated support for the conference.

I invite anyone interested in reviewing NFPA gas codes (at no charge) to do so at www.nfpa.org. From there you can visit NFPA's document information page, www.nfpa.org/aboutthecodes/list_of_codes_and_standards.asp, select the document you want to review and scroll down to the heading "Additional information about this document" and finally click on the link "Preview this document". NFPA is committed to enhancing worldwide public safety through the voluntary use, adoption and enforcement of its consensus-based codes and standards.

Tokyo Bosai Setsubi Co. Ltd. (TBS) announces partnership



TOKYO BOSAI SETSUBI CO. LTD. (TBS) of Japan announces that it has selected Unifire AB of Sweden and Rosenbauer International AG of Austria as partners for its innovative automatic fire detection and extinguishing CAFS system. The system, created by TBS, combines a fire detection system, a redundant central computer command system, Unifire stainless steel Force series remote-controlled water/foam monitors, thermal (and optional optical) cameras mounted on each Force monitor, and the Rosenbauer Flash CAFS system for added fire extinguishing effectiveness.

In the event a fire is detected by the fire detection system, a signal is sent to the systems controlling computer indicating the fires general location. The closest monitor (or monitors) then immediately begins scanning as the thermal imaging cameras locate and triangulate the exact position of the fire on an x, y, z coordinate

system. The coordinates of the fire are fed back to the controlling computer, which then calculates the best trajectory and accordingly aims the monitors to cover the fire. The entirely mechanical Rosenbauer Flash CAFS system then begins discharging a compressed air foam solution through the monitors, directly onto the fire,

without any external power supply. The monitor is preprogrammed to oscillate in a pattern most effective to cover the entire fire, and the nozzle is also programmed to effectively vary its spray pattern seamlessly between jet and spray. The parameters of the monitors oscillation and the nozzles spray pattern can be programmed to vary according to the size and location of the fire, and are fully adjustable to meet the customers particular needs.

The system can rapidly extinguish fires and limits the spray to the specific area where the fire breaks out. It can deploy fully automatically or, if desired, either semi-automatically or manually with the operators prior approval and/or intervention at any time. The system is designed to endure very harsh environments, including by use of the Unifire stainless steel 316 monitors, and it can be deployed in numerous environments such as tunnels, underground structures, refuse pits, oil tanks, parking garages, on the interior and exterior of buildings and warehouses, airport arrival halls, and in aircraft hangars, to name just a few.

For more information, contact:

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Angus Fire Releases New "Demystifying LNG" DVD

ANGUS FIRE has released a new DVD entitled "Demystifying LNG" that features the latest developments in fire fighting foam technology for Liquefied Natural Gas. Angus Fire is part of UTC Fire & Security, a unit of United Technologies Corp.

The DVD takes an in-depth look at the unique hazard posed by LNG and the need for specialist fire protection equipment and techniques. It features dramatic footage of recent large-scale tests carried out by Angus Fire and BP at the new world-class LNG testing and training facility at Texas A&M University.

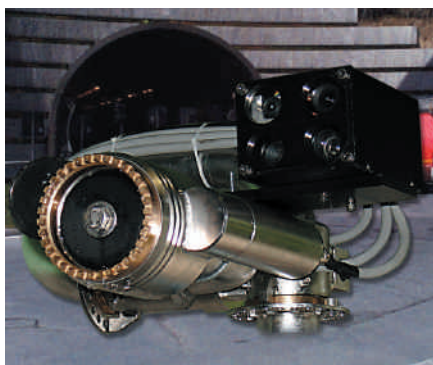
In a simulated LNG spillage, high expansion foam is shown controlling and dispersing flammable vapours safely away from potential sources of ignition. Also, in a series of huge fire tests, foam is shown reducing radiant heat emissions, the principal cause of damage from LNG fires.

The specialist Angus LNG Turbex generates high expansion foam despite prolonged exposure to the sub-zero temperatures of LNG vapour clouds and the searing heat of LNG fires. It uses Angus Expandol foam concentrate, which is widely used at LNG facilities around the world. The importance of selecting the correct foam expansion ratio and application rate is also emphasised on the DVD.

As the expansion of new LNG plants and upgrades continues world wide, the need for "Demystifying LNG" has never been greater. It is a "must see" for anyone involved in LNG fire safety.

For more information, please contact:

Angus Fire
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The invisibility of fire safety in public transport Areas

When developing concepts for the planning of a modern public transport area, architects and designers need to consider a number of requirements, including aesthetics, functionality, and safety issues.

Of course, these must be balanced with cost and budget considerations. The latest trends in design lean toward more transparent building structures that feature the largest possible glazed openings in interior walls (such as partitions in escape routes, floors or façades). And because the glass used in such a structure must prevent the spread of fire into other parts of the building, only the most sophisticated glass products are adapted to such requirements. While this principle applies to all huge public buildings and traffic centres, airports are among the best examples of structures requiring the multi-functional application of special glass products. Especially in terms of safety and fire resistance!

Large glazed areas of fire protection glass can be found in almost every modern airport. Vetrotech Saint-Gobain's most well-known fire resistant glass products, such as SGG CONTRAFLAM, SGG PYROSWISS and SGG SWISSFLAM STRUCTURE, are applied in glazed partitions and fire doors, and have been utilized for construction projects at the Unique Airport Zurich-Switzerland, where partitions were built with SGGPYROSWISS E30 glass, and in the new Hong Kong International Airport, where the roof glazing above shopping areas ensures compartmentisation in the case of a fire.

Vetrotech has recently completed several challenging projects that combine maximum visibility with maximum safety, which proves that such a balance can be achieved. One of these projects was conducted in one of Germany's InterCity Express (ICE) train stations, which happens to be located directly underneath the check-in areas of the Köln-Bonn (Cologne) Airport. Smoke curtains made from 30-minute fire-resistant integrity glass were

utilized to help protect airport dwellers from hazardous toxic gasses in the event of a train fire. Considering several tragedies of this nature, including the Madrid train station blasts in 2004 where 190 people were killed.

The fire safety and aesthetic requirements at the new Cologne-Bonn airport called for the first-ever application of vertical fire-resistant glass smoke curtains with point-fixed (spider) SGGVETROFLAM glass. Before its installation, the glass was successfully tested in an independent fire test laboratory in dimensions of up to 1150 x 3850 mm.

Vetrotech is now developing glass with similar dimensions for another airport project, this one at the Roissy-Charles de Gaulle Airport in Paris. The project will utilize SGGCONTRAFLAM STRUCTURE; an EI 60 fire rated "butt-joint" system with silicone sealing, in dimensions of up to 1250 x 3750 mm.

Fire resistant glasses, made by Vetrotech Saint-Gobain, are unique in terms of mechanical properties. All our glasses are tested for impact resistance and fulfil the highest classification for safety.

In addition, recent tests for explosion resistance according to EN 13541 have proven that glasses, designed for combined safety can withstand the requirements and bring additional safety within blast and fire building components.

Thus, Vetrotech Saint-Gobain glass products comply with arguably the widest range of safety evidence available today for glass in passive fire protection for building and marine construction; this allows us to provide you with an up-to-date product range for specific requirements in safety.

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If you have any questions regarding fire-resistant glass solutions for an airport project, please contact:
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Elkhart Brass Opens Enhanced Testing Center

7500 Square Foot Testing Facility. Result of Product-line and Company Growth



Continuing a commitment to providing the safest and highest quality products in the market, ELKHART BRASS is proud to announce the opening of an expanded, state-of-the-art test facility in their Elkhart, Indiana headquarters.

"Our new testing facility not only helps ensure we deliver the best and safest waterflow products, but also allows us to continue to design, develop and manufacture innovative solutions and get them to the market faster. The new Unibody Valve is a perfect example of this improved design-to-build execution process," stated Don Sjolín, Marketing Director for Elkhart Brass.

The test facility is the first of its kind in the industry and is an expansion of 7500 square feet to the current test centre. The

new expansion includes a 2400 square foot testing booth with over 30 yards of concrete creating a 50 ton back splash. The centre includes a 20,000 gallon holding/re-circulating tank feeding a CMU 2-stage Waterous Pump.

"R&D is critical for us to continue to be an innovator in waterflow equipment. The new test facility positions us to keep innovating for years to come," stated Don Sjolín.

The new test centre is live and operational and can be toured during visits to Elkhart Brass' headquarters.

For more information, please contact:
Elkhart Brass, Inc.
Email: dsjolin@elkhartbrass.com
Website: www.elkhartbrass.com

Announcing the new Argus™4, Truck Storage Mount and Battery Charger

The new Argus™4 Truck Storage Mount and Battery Charger provide secure storage with instant access for the Argus™4 Thermal Imaging Camera and charging facilities for the battery pack.



The unit is designed primarily for the storage of a camera within a fire truck, but can be fitted to any flat surface. The camera fits securely into the storage mount using a quick-release strap and will hold the camera with the handle either fitted or removed.

The battery charger will charge either the camera battery pack or the transmitter battery pack and charging can continue whether the vehicle is parked, running or in normal operation. The charger has a LED to indicate that the battery is being charged, and the unit will maintain the battery at full charge at all times without the risk of overcharging the battery. The battery charger can be fitted to the storage mount, or any area of the fire truck.

For more information, please visit
www.e2v.com

New PPS Lighting Range To Compliment Mass Decon And Blue Light Products

To compliment its incomparable range of decontamination and blue-light products PROFESSIONAL PROTECTION SYSTEMS has introduced a range of lighting units. The range embraces all needs and all situations from hand held and head lights to a range of flood lights.

A feature of the PPS flood light range is that it is battery charged eliminating the hazards created by trailing cables not to mention the need to have a source of power. They are also silent, non-conductive and cool running with the larger units offering up to 15 hours continuous running. The two best sellers in this range are the Starlite and Maxi 2000 floodlights. According to PPS Managing Director, Mark Whitcher, the Starlite is regarded as the most powerful rechargeable floodlight in the world. "There are simply no equivalents in the global market place" he says "that is why it is proving so popular with police, fire and emergency services generally". Its telescopic tripod gives it a maximum height of 3.5 metres, and even at this height, even in the most difficult conditions, it enjoys great stability thanks to the unusually wide spread of the tripod feet. Its primary beam



gives up to three hours standard whilst a secondary beam gives up to 10 hours. The other best seller, the Maxi 2000 is a rapid response unit which has proved itself with rail and electricity maintenance teams. An unusually wide range of accessories have made it a byword for flexibility and adaptability. It offers three kinds of bases for instance; gripper, magnetic or suction and it can also operate

from a vehicle cigar socket adapter thanks to a 5m extension lead option.

The head light range consists of the Matrix and the 2 in 1. The 2 in 1 is so called because it offers both high powered halogen bulb and ultra bright LED light in the same unit. The halogen light can be focused from spot to flood whilst the LED facility is ideal for close up work, consumes little power and can operate for over 100 hours. The Matrix can be adjusted through 90° vertically and is both water and shock resistant. With three lighting functions and a flashing mode for emergencies the Matrix bulbs are designed to last for 100,000 hours.

For a hand lamp PPS offer the Panther, a one million candlepower hand lamp with a one mile beam. The Panther is virtually unbreakable incorporating a toughened lens and a shock resistant polyethylene plastic casing. Suitable for use in all weather conditions it can operate for up to four hours when used on low beam and comes with a mains and vehicle charger.

For more information, please contact:
Professional Protection Systems Ltd.
Tel: +44(0) 1908 272240
Email: sales@ppsgb.com

South Australia Country Fire Service

Approximately a 25-minute drive from the centre of Adelaide, the Capital City of South Australia, you will find one of the most versatile volunteer firefighting brigades in South Australia – the Upper Sturt Fire Brigade (USFB).

Situated along the Mount Lofty ranges, this two-appliance station is home to 30-active volunteer firefighters who protect over 60-tonnes/hectare of highly dense bush land vegetation. Equipped with a 4WD, 2,000-litre, appliance called the Upper Sturt 24 and a 2WD, 1,000-litre mini-pumper called the Upper Sturt 12, the USFB attends anything from operational incidents such as brush and wildfires to structural fires, motor vehicle fires and even general rescue emergencies.

But unlike their urban counterparts, the region the USFB protects doesn't always have the luxury of hooking their appliance up to a fire hydrant or water line. What that means is the brigade needs to make sure they have enough water to do the job. And depending on the fire, you just don't know how much that is.

In the case of the USFB, if water was running low during a fire they either had to make sure a bulk water carrier was enroute to refill their appliance, or they had to leave, fill-up and come back. This might take anywhere from 10 to 15 minutes, and any firefighter will tell you 10 to 15 minutes is more than enough time for serious damage to occur.

The solution to their problem came in the form of a portable pump called the Floto-Pump™. Manufactured by Waterous, this small, powerful and cost-effective pump gave the USFB the versatility they needed to manage their water supply issues with enhanced efficiency.

In cases where there are not hydrants to fill the appliances, the Floto-Pump can be used to fill the appliance from an alternative water source such as a river, a swimming pool, holding dam or even a creek. "Sometimes conditions didn't allow us to get the fire appliance as close or as practical as we'd like it to be," said Dan Schiansky, Captain, Upper Sturt Brigade. "With the Floto-Pump, if there is a pool or a static water source nearby we can connect it to pump and directly attack the fire."

The USFB also serves as an effective tool when used for pumping water from holding dams located throughout the region. These types of dams are quite large and can be a useful water supply. "Before we didn't use the holding dams because they are clay-based, and using a fire appliance to pump from the dam would only pull the dirty water from the bottom of the dam, which is full of sludge and debris," said Schiansky. "Using the Floto-Pump, we don't run into that problem. The pump actually pulls in water off the top of the dam so sludge and debris is not a concern."

A recent example of when the USFB's effective methods came in to play was when the USFB was called to assist on a fire in the Mount Bold area, approximately 45-kilometers away from the station.



The fire, which was initiated in the grassland, had spread into a plantation pine forest and a water reservoir – a reservoir that holds water for the city of Adelaide.

On this particular day, the state was having extreme fire weather conditions due to high winds, dry fuel loading and low rainfall. "This allowed the fire to move and establish itself quite quickly," said Schiansky. "When it was all said and done and the fire was contained, it had spread to approximately 2,000 hectares."

When the USFB arrived on the scene, they were placed into "asset protection". Working with the Mt. Lofty Strike Team, the USFB had engaged the Upper Sturt 24. During the fight, the appliance was running low on water and was re-deployed to a nearby house that was under immediate threat.

On arrival, firefighters from the USFB saw that a vehicle was on fire next to the house. The garage was also fully engulfed, causing immediate danger to the house. The three appliances that were attending the fire were also low on water and were not able to continue to fight the fire. The Bulk water carriers were not able to enter the hot zone of the fire as it was too dangerous for their safety. That's when firefighters from the USFB began to look for possible alternatives to suppress the fire until the bulk water carriers could arrive when the fire became safe.

Noticing that there was a swimming pool at the front of the house Captain Schiansky, grabbed their brigade's Floto-Pump and placed it within the pool. Connecting a 38mm hose to the pump, Schiansky and his fellow firefighters were able to extinguish car and the house before it became fully involved, thus saving the house from destruction. "Even though we couldn't save the garage, we were able to save the house," says Schiansky.

"The area we were firefighting only had water in storage tanks or holding dams," said Schiansky. "If it wasn't for the Floto-Pump, we would have lost a house worth \$500,000. So was a \$3,000 investment in a portable pump worth it? Every penny!"

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For more information, please contact:

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The Gateway to a Disaster-Free World!

Join 'Fire & Safety EXPO KOREA 2007! It is the largest total safety exhibition of its kind in Korea covering every aspect of disaster prevention. About 200 leading fire & safety companies and 20,000 buyers from around the world will meet one another and explore the present and the future of the industry at the Fire & Safety EXPO Korea 2007, gateway to the Asian market.

Fire & Safety EXPO KOREA presents new upcoming innovations to make the safe world reality and brings together users and suppliers of the global fire and safety industry. At the same time, it offers a market where public procurement, B2B and B2C are dynamically blended in. You can find all the useful information here and meet key players from government, industry and academia all around the world.

All eyes of world professionals are centered on Fire & Safety EXPO KOREA 2007!

Korea is one of the biggest markets in Asia about USD 17 billion in the fire & safety area. Korean government (NEMA) has been eager to boom up the Fire & Safety Industry by strong policy and has supported Fire & Safety EXPO KOREA.

This exhibition has special program called 'Overseas Buyers Invitation Program' to provide easy access to overseas buyers. Don't miss such a cost-effective chance to visit Korea with less effort. This program provides free accommodation for two nights and breakfast in deluxe hotel to reliable buyers and includes 'free city tour', 'Interpretation service' and 'Shuttle bus service'.

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Please contact the secretariat:
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Fire & Safety EXPO KOREA 2007

April 24(Tue) ▶ 27(Fri) • EXCO(DAEGU)



Number of Exhibitors	20 Countries, 200 Companies, 800 Booths
Visitors(Expected)	Total 70,000 People from 40 Countries
Exhibits Profile	Fire Prevention, Fire Extinguishing, Rescue & EMS, Disaster prevention, City Safety, Industry Safety, Security
Conference & Events	Int'l fire prevention symposium, Int'l seminar on disaster, Academic conference, New Technology & Product Publication, Adventure 119

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Cranford Controls



Vantage family extended with 12V Blue Beacon for security applications

CRANFORD CONTROLS' Vantage range of high performance beacons for fire and security system applications has been extended with the introduction of a 12V blue version. The device uses the latest high output surface mount white LEDs to produce a brilliant 1Hz flash. Current consumption is 12mA in normal mode, or for large installations, low current mode can be selected during installation to reduce the current draw to 8mA to reduce power supply and battery back-up requirements.

The beacon itself is mounted into a separate base using a bayonet lock, allowing the unit to be easily changed if the system configuration is modified after installation. The separate base also means that the device itself does not have to be installed during the first fix, reducing the possibility of damage.

Cranford Controls is a leading independent manufacturer of audible and visual warning devices and ancillary products for use in the fire, security and process control industries.

For more information, please contact:
Cranford Controls Ltd.

Email: c.ayling@cranfordcontrols.com

Website: www.cranfordcontrols.com

Task Force Tips' New Jumbo BIV provides big water relief

TASK FORCE TIPS' new Jumbo BIV marries the industry's largest ball intake valve waterway with the industry's toughest coatings, producing a corrosion resistant valve that delivers huge water with loss of only 3 psi @ 2,000 gpm.

"We can't keep these jumbo valves on the shelves," said TFT's Vice President of Sales and Marketing Rod Carringer, pointing to a group of new Jumbo BIVs being prepared to ship. "I guess word got out from our field testing, because people started calling for them even before our new catalog came out."

The new Jumbo BIV's 5½ inch waterway is the answer to repeated requests for higher flows from customers who swear by TFT's top selling BIV – a unit that features a standard 3½ inch waterway. Although engineers nearly doubled the standard waterway size, they added less than an inch in unit height and 1½ inch in length.

"We've triple coated the BIV ever since it was introduced back in 2002," Carringer said. "Not only do we rely on our unique poly-impregnation process, but we also hard coat anodize AND powder coat finish them for additional protection against harsh environments. Then we used stainless steel components on the valve's wet side, as an extra layer of protection. If that doesn't convince you, remember that the Jumbo BIV's backed by TFT's remarkable five-year product guarantee."

The new Jumbo BIV's 30° elbow swivels 360°, allowing hose connections from any direction with minimal kinks and coupling stress. It also has a unique position



indicator that lets the operator know if the valve is opened, closed or somewhere in between. Its hand wheel, which can be installed on either the left or right side, takes a full 7½ turns to close, meeting NFPA slow-close requirements.

"All of which may sound like overkill. But that protection from corrosion is what allows TFT's BIVs to work under the most extreme conditions. Because, after all, firefighters work under extreme conditions every day," Carringer said. "This may be a new product, but it has the same TFT quality that people worldwide have grown accustomed to buying. Not to mention our 24 hour service line, which we've had for years, because most firefighters don't just work from nine to five."

For those with 4 inch or 4½ inch intake threads on their pump, TFT has two adapter rings that are featured in its new catalog.

For more information, please contact:

Task Force Tips, Inc.

Tel: +1 219 548 1051

Website: www.tft.com

The Wolf Safety Lamp Company – THE LIGHT CHOICE

The new Wolf rechargeable, lightweight R-50 safety torch, ATEX Certified to Zone 1, originally designed for the European firefighting market, is now becoming the preferred choice for offshore gas and oil operators around the world.

The R-50 incorporates new technology in the form of ultra lightweight, high capacity lithium-ion rechargeable cells, coupled with state-of-the-art battery control technology, which notably improves



performance and reliability, eliminating memory effect, thus reducing total 'cost of ownership' by extending the life-cycle of the product.

The outstanding beam from its LED light source penetrates smoke to a level never previously experienced, and with two levels of light output the torch provides up to six hours duration. Ergonomically designed with easy single-handed switching, the robust R-50 is also low maintenance, with quick component replacement. For additional safety, battery state-of-charge is shown as a bar of high intensity red LEDs, each one extinguishing as the battery charge diminishes. In an emergency, the R-50 can be recharged to 90 per cent capacity in 90 minutes.

For more information, please contact:

Wolf Safety Lamp Co Ltd.

Email: info@wolf-safety.co.uk

Website: www.wolf-safety.co.uk

A Beam Detector for all Installations

When it comes to optical beam smoke detectors no other company has the experience, or the product range, of **Fire Fighting Enterprises Ltd.** With well over 600,000 beams installed, including in some of the World's most prestigious buildings, it is clear that the FireRay series of projected beam detectors is the model of choice for both installers and specifiers.

The model range comprises:



The **FireRay 2000** end-to-end beam detector, a well-established product noted for its ruggedness, small detector head size and low level control. The small size of the transmitter and receiver mean that it is ideally suited to projects where a low visual impact is required, such as buildings of historical importance. The FireRay 2000 has CPD, EN54 and UL certification plus others. A typical installation is Hong Kong International Airport where the beams do not interfere with the stunning Norman Foster design.



The **FireRay 2000 Eexd** is the only ATEX 94/9/EC certified beam detector available. Its flameproof construction and robust housing make it particularly suitable for use in hazardous locations where other types of smoke detection would be unsuitable. Typical applications are oil refineries, petrochemical plants and warehouses for the storage of flammable liquids. These beams have been successfully used in ordnance bays in the Falkland Islands and in some marine applications.



The **FireRay 50/100** reflective beam detectors were amongst the first purpose built reflective products. The big advantage with this product is that both the transmitter and receiver are in the same discrete unit, which reduces the amount of cabling required thus saving time and significantly reduces installation costs. The FireRay 50/100 reflective has CPD, EN54 and UL certification plus others. This beam has been used in many prestigious locations including the British Museum and the Foreign Office in London.



The new flagship model of the range is the innovative **FireRay 5000 Auto-Aligning Infra-Red Optical Beam Smoke Detector**. This is a completely new design that incorporates pioneering technology that addresses the needs of both user and installer. Key features include: Easifit First Fix system; LASER assisted alignment, *AutoOptimise* automatic beam alignment and a 2-wire interface from the detector to the controller. This pioneering product is currently going through the approval process for CPD, EN54 and UL and is protected by British Patent Application 2426323 and by International Patent Application PCT/GB2006/1799 pending.

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Further details can be found at our website: www.ffeuk.com

Fire Safety Issues in Singapore, Then and Now

By J. C. Jones

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The island nation of Singapore was established as a British possession by Stamford Raffles in 1819. In 1855, by which time the population of Singapore had increased hugely, there were heavy financial losses through a major fire in Kling St. in the Chinese district.

There was no organised fire response team in Singapore until 1869, when the government created volunteer fire brigades which proved ineffective. In 1888 the City Council set up a single Singapore Fire Brigade which was properly capitalised with equipment and trained fire fighters. It used horse-drawn appliances until 1908 when these were replaced by motorised appliances. The year 1908 was a significant one for the Brigade in another respect: it was in that year that the Central Fire Station in Hill St. was opened. It had been built and fitted out at a cost of \$64000, an enormous sum in those days. A very imposing building and for many years the tallest building in Singapore, Central Fire Station is still functioning although parts of it are used to house a museum.

The remit of the Singapore Fire Brigade was extended in 1928 to take in ambulance services. In anticipation of war, the Brigade was in March 1939 augmented by an Auxiliary Fire Service. Then came the Japanese occupation of Singapore. At that time the Singapore Fire Brigade had many British officers, and the usual fate of British expatriate at the time of the occupation was to be sent to the appallingly cruel POW camp at Changi. British firemen serving with the Singapore Fire Brigade were spared internment at Changi because of the need for a fire service to remain in operation during the occupation.

The Singapore Fire Brigade retained that name until 1980 when it became the Singapore Fire Service. Major fires in the fighting of which the Brigade had had an involvement in the meantime include that at a squatter settlement in the part of Singapore known as Bukit Ho Swee in 1961, in which there were four deaths and eighty-five non-fatal injuries. Sixteen thousand people lost their homes, such as they were, in the fire. The fire is seen as having a place in social history in that it showed that not only disease and infection but also extreme fire hazards result when human beings have to live under such conditions. The reason is not at all difficult to understand: the fire load at a squatter camp would be higher than that in decent residences. The fire load in homes in the UK, averaged over the entire floor area, is typically 8 lb of flammable material per square foot of floor space. We can be quite sure that the fire load at Bukit Ho Swee at the time of the fire greatly exceeded this, with the tragic consequences

described. Just over a decade after the Bukit Ho Swee fire came that at Robinson's Department store in Raffles Place, Singapore. This had been founded as far back as 1858 and by the time of the fire had a number of branches in the region and a franchise to sell Marks and Spencer products. In November 1972 the store was destroyed by fire with the loss of nine lives.

At the present time the Singapore-Malaysia region is becoming a leading centre for oil and gas activity. Singapore itself is chiefly in downstream activity including refining. The Bukom refinery in Singapore is the largest of all the refineries in the world operated by Shell, processing 500,000 barrels of crude oil per day largely for export to other countries of the Far East. Huge quantities of hydrocarbons pass through the Port of Singapore. Such activity brings commensurate responsibility in terms of fire protection and preparedness for a major fire and in the 'post 9/11' world there is the added dimension of possible terrorism. A vessel containing liquefied natural gas (LNG) is a possible terrorist target, there being a great deal of LNG transportation by sea to countries including Japan. There have been concerns about LNG tankers in Boston Harbour, where such tankers pass quite close to residential property. That is one reason why it is proposed to build a storage facility for LNG at Outer Brewster Island, ten miles out to sea from Boston and currently a redundant military site. There is a great deal of LNG activity in Singapore and proposals to build an LNG terminal. The concerns about Boston apply also to Singapore: an LNG tanker there or an LNG facility onshore could be a target for terrorism.

This article began by tracing the development of a fire service for Singapore when it was a British territory with a highly varied racial profile. It has also pointed out the significance of the fire at Bukit Ho Swee. Singapore is now an island state of population about 3.5 million and a major centre of affairs in the hydrocarbon industry. The article will conclude with two points which the present author does not necessarily unreservedly endorse but which will interest readers. One is that the Bukit Ho Swee fire has been compared to the Great Fire of London. The other is that in terms of oil and gas supply Singapore is being compared with Houston. Thoughtful readers should evaluate each of those for themselves!

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Fire Fighting Monitors:

Selecting the Right One for your Application

Fire fighting monitors are used to apply water, foam or dual agents wherever there are large quantities of flammable or combustible liquids. Storage and process areas in the oil and petrochemical sectors are the most common applications. In the world of transport they are found on shipping and loading jetties, airport crash tenders, aircraft hangars and helicopter landing areas. Industrial applications include power stations and incineration plants. Monitors catering for all these different applications are available in a bewildering choice of designs, sizes, materials and nozzle configurations. Here Michael Mills of Angus Fire explains how to choose the right monitor for your application.

By Michael Mills

Product Manager,
Angus Fire

Storage facilities

Monitors are widely used for protecting storage tanks containing hydrocarbon and polar solvent flammable liquid risks. Fixed systems incorporate hand-operated monitors, geared monitors with hand wheels and oscillating monitors. These are used not only to apply foam on to fires but also to cool adjacent tanks. Flows of 4,000 to 7,500 lpm at 7 bar will normally achieve an adequate reach.

Supplementary cover is provided by portable and mobile monitors. Small monitors can be designed to be carried by hand and placed on the ground to provide a rapid response in the event of

a fire. They must be properly secured so they cannot move once the water flow and pressure is applied, usually by means of fire hoses and portable pumps. Portable ground monitors should combine light weight with stability, and be quick and easy to deploy and fold away. Light alloy models with 2½ inch inlet connections have capacities of around 1800 lpm at 7 bar but higher outputs can be achieved by using an anchor spike on soft ground that helps to resist the jet reaction forces.

Larger hand-portable models with 3 and 4 inch inlets and capacities of 2,700 to 3,700 lpm at 7 bar are secured by means of an adjustable bipod arrangement. The throw is defined in terms of

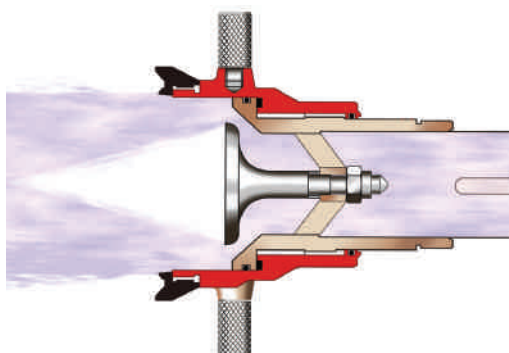


height and distance. For example, the Angus Titan will put foam on to the top of a fuel storage tank 20 metres high from a distance of 30 metres.

Moving up the scale, monitors such as the Angus Colossus with capacities ranging from 3,000 to 40,000 lpm can also be mounted on trailers. The mobile monitor can be used to reach areas not well covered by fixed monitors. Trailers are often fitted with outriggers to provide stability and water tanks on the trailer can be filled to provide additional weight for stability. Extra tanks can also be specified to provide foam.

Restricted access

In some applications, such as loading jetties or locations with explosive atmospheres, it is necessary to operate a monitor remotely. To do this motors are fitted to move the monitor body in the horizontal and vertical planes. In addition, if the monitor is fitted with an adjustable nozzle this will also need to be moved with a motor or actuator. Remote control monitors often need to meet the standards for operation in an area subject to explosive gases such as ATEX in Europe or NEC in the USA. Some applications require a master panel and slave panel arrangement, while others require feedback to show the operator where the monitor is pointing so that it can be operated even when smoke obscures the view.



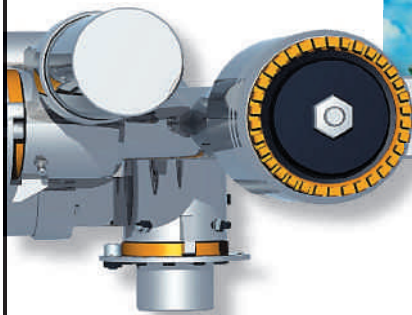
Remote control monitors are available with hydraulic or electric drives or a combination of both. Hydraulic motors have the advantages of low cost, simplicity, ease of maintenance and are usually explosive proof. There is no need to use limit switches on the motors since they simply recycle the hydraulic fluid without damage when they reach the limit of travel. Their compactness makes them ideal for marine jetty protection, ships, incineration plants and power generation. However, the maximum distance between the monitor and control panel is limited to 300 metres and there are no facilities for a secondary panel or position indicators.

In some applications, such as loading jetties or locations with explosive atmospheres, it is necessary to operate a monitor remotely.

Electric motors must have a mechanism to stop the current when they reach the limit of travel or they may burn out. Modern positioning encoders and electronic controls are today replacing the more traditional overload protection devices. Electric motors have the advantages of a possible master and slave panel arrangement, built-in encoders that will show the monitor position if required, and the distance between the monitor and master panel is unlimited. However, electric models can be expensive if explosive proof motors are necessary. Secondary panels in an explosive area also need to be contained in explosive proof casings.

For some applications, combined hydraulic/electric systems are preferred. In these the monitor is moved using hydraulic motors, but the hydraulic power is provided by individual hydraulic power packs mounted at the base of the monitor. The power packs are generally explosive proof.

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The advantages of this arrangement are that it combines the benefits of using hydraulic motors with the benefits of electrical control panels, retaining the option of a slave panel and no distance limitations between the master panel and the monitor.

Explosive environments

Monitors often need to be sited in areas where gases or flammable liquids that give off vapours are processed, stored or transported. While there is little risk of explosion when the liquids and gases are contained, it must be assumed that there is a risk of explosion if there is a breakdown, a release or a fire. To allow for this, specifications normally call for monitors and their control systems to be manufactured and approved to international explosion proof standards such as the European ATEX (ATmosphères EXplosibles)

or NEC (National Electrical Code) in the USA.

Under the ATEX Directive most monitors will be sited in a "Zone 1" atmosphere where ignitable concentrations of flammable gases, vapours or liquids are likely to exist under normal operating conditions. Zone 1 requires monitors and control equipment to be "Group II" approved. A Zone 1 environment requires equipment classified as "Category 2G", where G stands for gas. The type of protection applied is defined by the CENELEC (Comité Européen de Normalisation Electro-technique) code. Ratings are described by a letter preceded by "EEx". An explosive or flame proof enclosure for a control panel intended for a Zone 1 area would be classed as "EEx d". In addition, the maximum surface temperature the equipment can generate is also added to ensure it cannot form the source of ignition for any gases present. The code "T4" indicates a maximum temperature



of 135°C, which caters for most fire fighting requirements in industrial areas. Therefore, for a monitor used to protect a Zone 1 area, for example a hydrocarbon loading jetty, the ATEX approval should read “CE Ex II 2 II EEx d T4”.

Under the NEC system, areas are firstly given a “Class” location for specific applications. Class 1 covers flammable gases, vapours or liquids. Classes are further divided into “Divisions”. Division 2 is defined as “Where ignitable concentrations of flammable gases, vapours or liquids are not likely to exist under normal operating conditions”. There is a further classification for the type of gas or vapour that may be present and their ignition temperatures. Most industrial groups fall under Groups C and D. Therefore, a typical monitor installed under the US classification system may be required to operate in a Class 1, Division 2 area in which gases in Groups C and D may be present.

The ATEX system became mandatory in Europe in July 2003 and reflects a more up-to-date method of working. It also takes into account a wider range of parameters than the US system. As a result, ATEX is a more comprehensive system and is therefore preferred for most fire fighting specifications.

Transport applications

A wide range of oscillating monitors is available which provides a powerful, sweeping water stream for high performance attack and protection. These are used principally in aircraft hangars and on offshore helicopter landing areas.

Safety levels at airports have been rising in recent years thanks to greater use of advanced oscillating monitor technology in aircraft hangars. Fire protection for aircraft hangars, whether civil or military, has traditionally been based on NFPA 409. Generally the requirements have been for foam-water deluge systems incorporating sprinkler heads such as the Angus K40 supplemented by low-level oscillating foam monitors for under-wing protection.

But in recent years operators have been moving away from overhead sprinkler systems in favour of oscillating monitors mounted not only at low-level for under-wing protection, but also at high level for fuselage and over-wing protection. The main reason for this trend is the growing belief that most hangar fires occur at floor-level. It takes less time for foam to reach such fires from floor-mounted monitors than from sprinklers mounted on high ceilings. Monitors sweeping automatically through pre-set arcs of oscillation can cover vast areas of hangar floor space with foam within seconds of actuation.

Safety levels at airports have been rising in recent years thanks to greater use of advanced oscillating monitor technology in aircraft hangars.

The effectiveness of overhead sprinkler systems in extinguishing fires that occur inside parked aircraft has also been called into question. While the gentle downward flow of foam from sprinklers may be deflected by air turbulence created by such fires, oscillating monitors mounted at high-level ensure a more powerful and penetrating delivery of foam.

Another important consideration is that monitor systems require lower water demands and reservoirs, lower pumping capacity, and simpler piping arrangements than overhead sprinkler systems. In other words, they are simpler and cheaper to install, maintain and operate.

Automatic oscillating monitors are generally fabricated from bronze and are available in capacities of 4,000 to 8,500 lpm at 7 bar. The oscillating mechanism does not require filtered water and a broad oscillation angle is normally adjustable from 45° to 120°. The number, capacities and locations of oscillating monitors depend on factors such as the hangar layout, available water pressures and the aircraft parking areas requiring coverage. **APF**

Michael Mills is Product Manager at Angus Fire, responsible for the global marketing of the company's Streamline range of fire fighting monitors. Angus Fire has been at the forefront of fire fighting monitor development for over forty years including fixed and mobile, manual and remote control, water and foam models. Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, which provides fire safety and security solutions to more than one million customers around the world. UTC Fire & Security is headquartered in Connecticut, USA.



When Response Time Matters

The Nittan Model 2RA-P is a point type flame detector capable of providing a very fast response due to its high sensitivity. It is a sensor with state-of-the-art technology that drastically reduces the occurrence of false alarms whilst remaining highly sensitive.

It detects infrared energy emitted in fire and sends a signal to an automatic fire alarm system or to a fire alarm control panel.

It is capable of providing a supervision distance of 17m ~ 30m and a supervision angle of 100° Max.

For the detection of Infrared energy, a "pyro-electric effect" is used to detect the flicker frequency of the flame (1 – 10 Hz) and monitor the special characteristics of CO₂ resonant emission from the flame (wavelength of 4.3µm), as well as a non-fire-alarm discrimination wavelength region (around 4.0µm), thus, increasing the reliability of the detector with respect to false alarms.

The 2RA-P declares a fire only if the following condition is reached:

CO₂ Resonant Emission Signal level > Non Fire Alarm Signal Level.





Effective Fire System Warning Devices

By Dave Coverdale

Cranford Controls

All emergency alarm systems contain audible and visual signals to alert people of danger once a hazard has been detected. Until the development of the folded horn sounder, the fire alarm bell was the only audible warning device available; although it generates a familiar and unambiguous noise, it was originally a current hungry device, unsuitable for use in today's systems.

Recent technology advances in the design of fire alarm bells have reduced current consumption significantly; they now require only a few milliamps for operation, making them compatible with electronic sounders. Bells are still extremely popular, particularly in smaller and less sophisticated installations. Obviously, they only generate a single tone, unlike electronic sounders where today's devices typically generate 30 or 40 different tones. Part of the reason for the proliferation of different tones is that the various regulatory authorities often define specific tones, and, with multi-stage alerts increasingly common, several clearly distinguishable tones are obviously required to differentiate between the various stages.

The effectiveness of a sounder is highly dependent on the frequency of the tone being generated. The efficiency of the transducer is

frequency dependent, as is the attenuation of the generated sound with distance. The convention, followed by most manufacturers, is to state a dB(A) output level at 1 metre, but specifiers should carefully read the small print in the specification, because in a multi-tone sounder, the dB levels of the various user-selectable tones of different frequency can vary drastically. In general, for lower frequency tones of less than 1000Hz, the lower the dB output level, and for higher frequency tones, greater than 1000Hz, the higher the dB level. Given that sound is a pressure wave, it is not difficult to see that to convert electrical energy into sound is less efficient at lower frequencies because the transducer has to move larger volumes of air to achieve the same sound pressure level. The attenuation factor with distance is also frequency dependent, with the attenuation slope steeper at higher frequencies: in everyday life, this



is why one only hears the bass notes from a loud source of music some distance away. The other consideration to be taken into account is the tolerance specified for the output level: 3dB makes quite a difference.

The majority of manufacturers produce different families of devices offering various output levels and physical configurations, both to ensure that the output of the device is suitable for the application and to give low cost installation. Typically, sounders are either stand-alone wall or ceiling mounted devices; alternatively for many commercial applications the sounders are designed to be

mounted under smoke detectors to reduce installation costs and to give a single integrated unit.

In the UK, BS5839 Part 1, the Code of Practice for the installation of fire alarm systems, states that the output from a sounder must be between 65 and 120dB(A) and that the overall output from the sounders must be at least 5dB above the known ambient background noise level. The sound level reduces by 6dB every time the distance from the source doubles, so, for example, in an environment with an ambient noise level of 65dB(A), the effective distance of a 100dB(A)@ 1 metre sounder is 32m, the distance at which the

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sounder output level reduces to 70dB(A). Compare the effective distance, 32m, of a 100dB(A) sounder with that of an 88dB(A) unit, which drops to 70dB at 8m, giving an area coverage 16 times greater with a 12dB difference in output level. This reduction in the effective distance emphasises the importance of checking the output level against frequency. However, high output sounders should not be used in low ambient noise areas or as a means of "drenching" the area in sound. Alarm systems that are too loud may be dangerous, cause panic, discomfort, and make communication very difficult, impeding evacuation procedures. The overall alarm level throughout the area should be a maximum of 10 to 15dB above the ambient background noise. Combined voice and tone alarms give an unambiguous message if used correctly, but the voice component is more likely to be more directional and will usually be at least 6 dB(A) less than the tone; this must be allowed for when designing the system as the tone element will be audible at least twice as far away as the verbal messages.

In the open, sound will spread in all directions, but in an enclosed space, some will be reflected, giving an increased sound level. The closer a wall-mounted sounder is positioned to the ceiling, the more sound will be reflected; for a ceiling mounted unit, the reverse is equally true. A sounder mounted on a wall is more effective than when mounted on a pillar. Sounders should be sited so as to avoid immediate obstacles and at an ideal height of 2 to 2.5 metres. Synchronised sounders give a more effective overall effect because the sound pressure waves tend to reinforce each other rather than cancelling themselves out.

Visual warning devices

Increasingly, fire legislation around the world is requiring that audible warnings are supported by a visual indicator to ensure that the deaf are made aware of an emergency. A further increasingly common requirement is that beacons should be synchronised to reduce the risk of triggering epileptic seizures in susceptible people. A visual indicator should only be used as reinforcement to an audible signal, not as the primary hazard signal. The visibility of a beacon is dependent on the brightness of the light source and the lens colour: as a rule of thumb, the intensity of a beacon is reduced by 25% as the viewing distance doubles.



Quality

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	Lens colour					
Light Source	Clear	Yellow	Amber	Red	Blue	Green
Xenon	100%	93%	70%	23%	24%	25%
Filament	100%	95%	70%	17%	17%	12%

Beacons should be positioned to be in direct line of sight with the maximum light output emitted over the desired area of coverage. The effective area of a beacon is a function of the typically horseshoe shaped Xenon tube and the mounting angle of the lens. Operating at very high voltage generated by an inverter circuit, the Xenon gas in the tube breaks down, creating an instantaneous brilliant flash of light, normally enhanced by using a 'Fresnel' lens. The light energy of the flash is a function of the Xenon tube size, the voltage across it and the capacity of the capacitor discharging into it. The Xenon strobe beacon has the best light output to power input ratio and is the most widely used and versatile technology currently available. Tube life is critical: it may be as little as 1 million flashes in cheaper devices but specifiers should typically expect 5 to 8 million flashes from higher quality units. All round light dispersion should be the first consideration when installing a beacon; ensuring free air movement to prevent the build up of excessive heat, is also important. Xenon beacon manufacturers specify performance in a number of ways: probably the most common measure is the incident energy applied to the beacon tube, expressed in Joules or the incident energy of the device measured in Watts. More meaningful are the peak and average output light

emissions expressed in candela. "Brightness", often presented as a polar plot, is often used for more accurate calculations and coverage predictions. The perceived brightness of a beacon is dependent on the brightness of the light source, the lens colour of the unit and the ambient light level.

The effect of lens colour on the perceived intensity of the light source within an industrial environment is quite significant.

Recently, LED technology has rapidly developed, and the emergence of ultra bright LEDs means the LED beacon has become a viable and effective low maintenance alternative to the Xenon strobe. The use of multi-LED arrays enables different flash rates, rotating modes and steady state illumination to be easily achieved, extending the capabilities and versatility of the units.

Hazardous Areas

Warning devices are required throughout the protected premises; in hazardous areas, precautions obviously have to be taken to prevent installed equipment initiating a fire or explosion. Warning device manufacturers generally offer both explosion proof and intrinsically safe units. In explosion proof units, the sealing of the enclosure in which the device is housed serves a two-fold purpose. The sealed design prevents the ingress of gas or



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dust in the first place and ensures that if an explosion is initiated inside the unit, the flame and pressure front is contained. Intrinsically safe devices use barriers located in the safe area to restrict the amount of incident energy available to the unit. The design of the units is closely controlled with large creepage distances between conductors and other measures to ensure that an explosion cannot be initiated by the device.

A drawback to intrinsically safe beacons is that they cannot perform to their full potential because the limited input energy that is allowed to pass through the Zener barrier or galvanic isolator is not sufficient to drive a Xenon tube to its full potential, significantly reducing its light output. To overcome this problem, the latest designs of intrinsically safe beacons use an array of ultra bright LEDs to produce a bright flashing warning signal in Hazardous Areas, giving a far more effective visual warning than the Xenon tube beacon alternatives. High output LEDs have several advantages over the Xenon tube: they are mechanically robust, so service life, particularly if installed in an environment where shock and vibration is present, is extended. The solid state devices are also highly efficient at converting electrical energy into light, producing a high intensity light source over the lifetime of the device without significant reduction due to ageing.

Conclusions

Sounders are the primary mechanism for alerting people in the event of an emergency. Voice alarms and strobes also have their benefits; the main job of the system designer is to ensure that the audible and visual output levels are adequate throughout the protected area. With so many different sizes and styles of sounder and beacon, offering different output levels and degrees of control available, it is essential that the system designer and manufacturer work closely together to ensure that the optimum devices are specified for each type and size of protected area. The implications of choosing between explosion proof and intrinsically safe units for hazardous area use and the levels of environmental sealing required for devices installed in dusty or dirty areas are further complications; again, the manufacturer is in the best position to assist the system designer achieve an effective solution at realistic cost. **APF**

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Firefighter Protection:

Is improved wearer comfort a trade-off against safety?



By Paul Gibson

Regional Export Sales
Manager at Bristol
Uniforms

It is testimony to the research and development work undertaken by the major producers of high performance fabrics and the design advances made by the leading PPE manufacturers that today's firefighter clothing is not only more comfortable for the wearer but, in some key respects, safer, too.

Compared with the PPE offerings available to world markets at the turn of the millennium, today's designs incorporate a number of major advances which have been developed around customer feedback and practical trials aimed at identifying the key elements which go to make up an improved product. During the last 5 to 10 years we have also seen both the Europeans and Americans review and issue new PPE standards which combine improvements in performance and safety whilst allowing for the introduction of designs which also make for greater wearer comfort.

For many years since the early designs of specialist firefighter PPE in the 1960s, through the developments in the 1980's and up to the end of last century, manufacturers had relied upon established fibre and textile technology to provide the basic layers of the garments used to protect

the wearer from the hazards of flame and water in structural firefighting. These garments incorporated inner layers of felt which were bulky and inflexible making them uncomfortable to wear, particularly over extended periods.

A balancing act

There has always been the need for PPE manufacturers to achieve a balance between comfort and safety and it is only in more recent times that fabric technology has allowed us to improve substantially the safety of PPE whilst, at the same time, enhancing the wearability of protective clothing.

As the knights of old would testify, if they were alive to tell the tale, full body armour was highly effective as a defence against pikestaves, axes and various other instruments of medieval warfare but was so heavy that the wearer had to be lifted onto



his horse where, no doubt, many expired from sheer exhaustion under the weight of their PPE. No doubt, also, many a horse collapsed under the weight of rider and armour.

Today we have a wide selection of high performance materials and fabrics which give body protection against everything from ballistics to flame and from water to airborne pollution including viral and nuclear contamination. It is the design skills of the PPE manufacturer which are the key to selecting and using in combination the very best protective layers whilst at the same time doing everything possible to minimise the stress on the wearer of carrying around the PPE on their bodies when on active service.

Standards to meet

The health and safety of the emergency services has become a key focus of attention over the last 25 years as new, and increasingly rigorous, safety standards have been enshrined in regulations. The means to achieving the levels of protection required has been a major driving force behind the development programmes of all the major manufacturers during this time.

The major standards bodies across the world, including the 3 main ones ISO, EN and NFPA, have upgraded their PPE specifications to take account of changes in the hazards to which the wearer is exposed but have taken less account of the impact of specification changes on wearer comfort. This is not to say that comfort has been ignored totally but, that in arriving at methods for wearer

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testing, the level of consideration given has sometimes lacked the incisiveness and rigour which could have driven such standards forward more effectively.

Whilst the standards themselves specify protection performance, it is the annexes which consider the practical aspects of wearability and set out guidelines as to how the various tests should be carried out.

An example of the need for there to be a closer integration between standards setting organisations and firefighter operating procedures was highlighted in late 2003 during independent heat stress trials being carried out for Bristol Uniforms by specialist human factors consultancy Human Vertex Ltd at Birmingham University. PrEN469:2002, Annex F, the draft European protocol for use in human physiology research for testing firefighter PPE, was called into serious doubt, when, in an unexpected development, attempts to use the proposed exercise protocol and assessment methodology as set out in the annex showed the protocol to be too severe to allow meaningful results to be achieved. Not only did the Standard present a general methodology that was difficult to interpret and reproduce in the laboratory but, after the initial 6 tests conducted during the week-long trials on fire kit then currently in use, none of the fire kit assemblies tested had met the requirements of the standard.

The health and safety of the emergency services has become a key focus of attention over the last 25 years as new, and increasingly rigorous, safety standards have been enshrined in regulations.

At the time Human Vertex Ltd reported that in their opinion, "it would have been very unlikely that any effective fire kit would have passed the standard. Furthermore, it was felt that the exercise protocol was unrealistic and dangerous in that it required the firefighter volunteers to run in fire kit for over 15 minutes – an activity that goes against standard Fire & Rescue Service operating procedures".

This situation was drawn to the attention of BSI's PH3/2 Heat and Flame Protective Clothing Committee which withdrew the Annex. At the time, Dave Matthews, Convenor of WG2 expressed his concern stating, "It is good to see British manufacturers actively involved in critically assessing the practicality of test protocols in this way and, in doing so, helping to lead the development of better standards of product and firefighter safety not only in the UK but across the European Union".

It is, perhaps, a reflection of the lesser importance attached to the Annex, which is, in any case, only an informative document, that no new Annex has yet been published although its status is currently described as 'amendment under development'. Across Europe there are



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differences of opinion as to what the Annex should include. A meeting of Technical Committee TC162/WG2 responsible for developing standards for clothing for PPE meets in Manchester (UK) in March 2007 to discuss work in progress and there is an expectation that a new Annex will be included in the mid-term revisions in EN469:2008.

Comfort – impact of user collaboration

Whilst objective measurable tests provide the basis for determining those features which have a positive effect on the physiological response of the wearer, the subjective evaluation in wearer trials is of considerable importance in the eventual choice of firefighter PPE. This is true whether the garments in question are for structural firefighting, urban search & rescue work or wild-land firefighting.

There are indications that firefighter clothing is starting to be selected with style and comfort in mind.

Whilst it may not yet be accurate to say that a firefighter's lifestyle has a significant impact on his or her choice of PPE workwear, there are indications that, in the same way that corporatewear has been increasingly influenced by fashion, firefighter clothing is starting to be selected with style and comfort in mind.

A good example of collaborative working resulted in the supply of new fire clothing to the Community of Madrid, Spain's largest fire service, involving the supply of over 1700 sets of fire coats

and trousers 3 years ago. The new lightweight specification incorporated a Nomex® Ti-Technology outershell and Gore-Tex® Airlock, a unique combination of thermal protection and moisture barrier. Paco Griso Raventos, Managing Director of Sasatex, Bristol Uniforms' agent in Spain commented, "In my opinion the contract has been awarded to us for having made an ergonomically designed garment which has taken the Bristol Ergotech™ style to a new level. Today's Spanish firefighters are younger and more sports orientated, and in their free time use technical garments. They want to carry this technology through to the garments they wear in their working day. The Madrid Firefighting suit is adjusted to the natural shape of the body and allows greater freedom of movement".

Importance of sizing

Correct fit is yet another area which has become a key issue in clothing generally, particularly where garments are designed to provide protection or support. In women's clothing there has been much publicity given in recent years to the health implications to women wearing ill-fitting garments.

In an article in *Company Clothing* in May 2004 a report by Dr Mandy Sowerby, scientific advisor at Leicestershire Fire & Rescue, was discussed. It drew attention to the need for female firefighters to be included in PPE design parameters. In an informal questionnaire amongst female firefighters she found considerable dissatisfaction about problems with fit and comfort and that PPE generally was failing to reflect the diversity of today's fire service. She was quoted as saying, "We must insist on a user-centred approach and design PPE around the firefighter rather than expect them to adapt".

Leading PPE manufacturers have already taken

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note of the study. Bristol Uniforms, for example, has offered a female range since 1996 and the report provided an opportunity to review sizing. The company offers 4 height and 7 girth size options for females thus offering 28 size options for its range of PPE styles – the same number of

options as available to male firefighters. Ian Mitchell, joint MD, commented, "We found our increments between sizes were correct but the range of sizes started too large so we were able to start with a smaller size. We were pleased with our pattern grading".

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There is general consensus in the industry that closer attention needs to be paid to anthropometry to ensure that wearer comfort is ensured through regularly revisiting size and pattern grading as body shapes change over time.

Climatic considerations

It is interesting to reflect on the fact that with the introduction of high performance PPE with excellent fire protective properties which allow firefighters to get closer to fires than ever before the incidence of heat stress related incidents has increased. In the UK, a technical spokesman for Bedfordshire & Luton Fire and Rescue Service was quoted as saying that, "PPE is so technically advanced now and flame retardancy so good that firefighters can get closer to the action. The downside is that they are unwittingly absorbing more heat and suffering from heat stress. I've seen more firefighters collapsing and being dragged away from fires whereas years ago the impact of the heat would have pushed them back".

Over the last 10 years, what was once a trade-off between safety and comfort has increasingly been overcome by major advances in fabric technology and PPE design.

This emphasises the need for greater attention to be given to garment construction which recognises the need for elevated body temperatures to be minimised by the use of combinations which allow improved levels of heat dissipation.

This is particularly important in hot and humid climates such as those commonly experienced in the Asia Pacific region. New fabrics are being increasingly used in the latest PPE designs such as the Ergotech™ and Ergotech Action™ styles introduced by Bristol Uniforms some 5 years ago and are now in widespread use around the world. A number of fire & rescue services in Malaysia and New Zealand have now moved over to specifying Ergotech™ fire coats and trousers whilst one of the largest fire & rescue services in the region, Hong Kong, has adopted a bespoke style incorporating a Gore-Tex® Airlock thermal barrier, designed to maximise escape of body heat, used under a DeltaT® outershell.

Conclusions

Over the last 10 years, what was once a trade-off between safety and comfort has increasingly been overcome by major advances in fabric technology and PPE design. The world's leading manufacturers of internationally recognised brands of firefighter clothing and accessories have risen to the challenge. They have researched their markets and introduced designs and styles which not only meet the safety criteria required by ISO, EN and NFPA standards but have reduced the physical bulk of garments and incorporated levels of flexibility which go a long way to satisfying the greater comfort demanded by today's firefighting women and men on the front line.

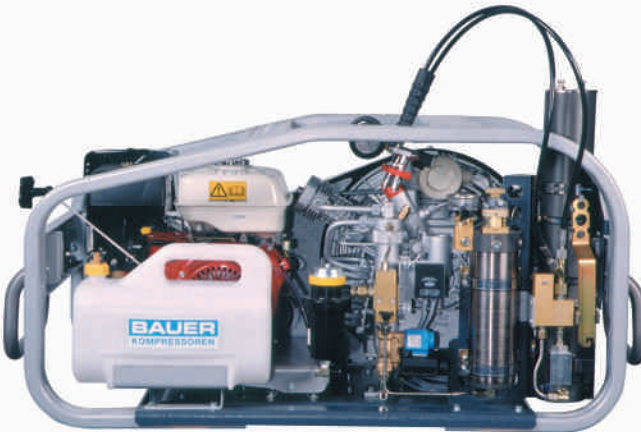
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By Brendon Morris Holmatro Rescue Equipment by

It is well understood that, in order to perform vehicle extrication rescue effectively, a mix of both theoretical understanding and practical skills are required. The procedures of stabilisation, space-creation and eventual patient removal are all practical operations that need to be performed with a high level of skill.

At the same time, however, it is essential that these psychomotor skills be performed with a good understanding of the various implications they may have. For instance, considerations of safety and medical care are critical and need to be well understood by the rescuer. Thus in order to ensure that extrication rescue is not merely seen as a practical skill, a good mix of different educational techniques will need to be employed in your extrication rescue training program.

Roughly speaking extrication rescue educational techniques can be discussed under three headings. These are theoretical sessions, hands-on "skill" sessions and finally hands-on "scenario" sessions. Discussed briefly below all three of these

educational techniques have a roll to play in the creation of a complete extrication rescue training program.

Theoretical sessions are often required to ensure a firm basis on which to build the rest of the knowledge creation that needs to be achieved. For this reason starting in the classroom is always a good way to begin a program. Even in the case of an advanced training workshop for experienced rescuers the use of some classroom time is useful. A brief discussion in the classroom before heading out for a hands-on session will provide the opportunity for a structured safety briefing, as well as allow the facilitator to give an overview of what the planned outcomes of the educational event are. This provides the required structure that is often missing in such workshop

Rescue Education



educational program, there are many points to consider. The well balanced use of both theory and practical time is a critical consideration for the development of a successful program. In this article I have discussed mainly rescue type skills and understanding. It must, however, be mentioned that the understanding of the medical care of the entrapped patient is as important, and, as such, should also be given the time it affords, in any educational program developed. Time spent properly planning the education of extrication rescuers that you are responsible for, is time well spent. I trust that this article has given you some food for thought in this regard. **APF**

hands-on sessions for experienced rescuers.

The two types of hands-on educational sessions are similar in that they both involve practical hands-on work but at the same time they are also fundamentally different in their desired outcome. Hands-on skills sessions should be used primarily for inexperienced rescuers who need to be taught the fundamentals of the various separate techniques that need to be used together for the completion of an actual extrication job.

Examples of generic techniques that might be taught in this way include, but are not limited to:

- Vehicle stabilisation techniques
- Door removal techniques
- Glass management techniques
- Roof removal techniques
- Dashboard displacement and other space creation techniques

The second type of hands-on training is that of scenarios based hands-on training. These sessions should be used to ensure that the separate generic skills mentioned above (taught through the skills sessions) can be used together effectively and efficiently to complete an extrication. These two types of hands-on sessions should not be seen in isolation, but should rather be considered in sequence, as a natural progression of understanding required to create an effective extrication rescue team.

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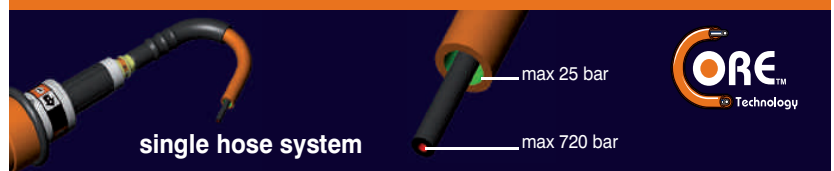
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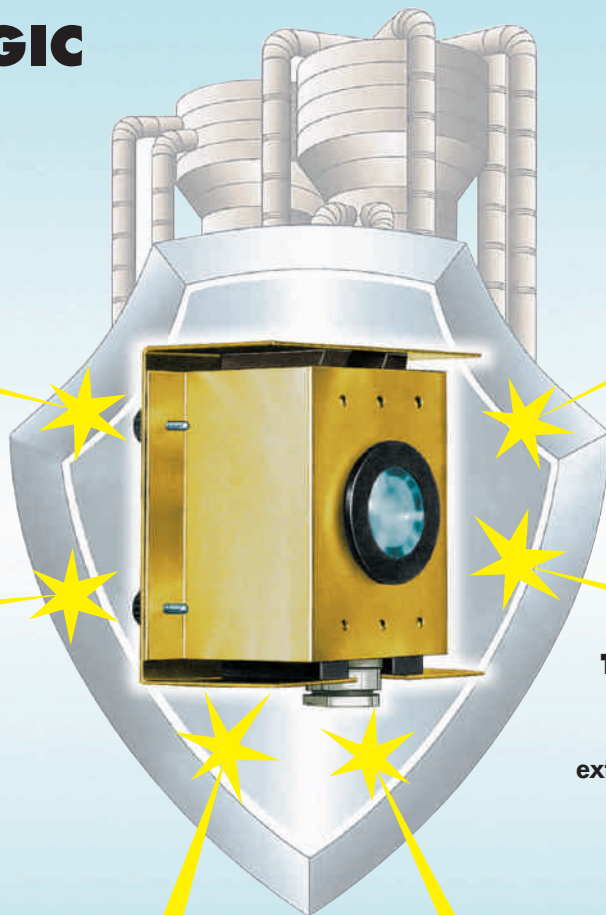
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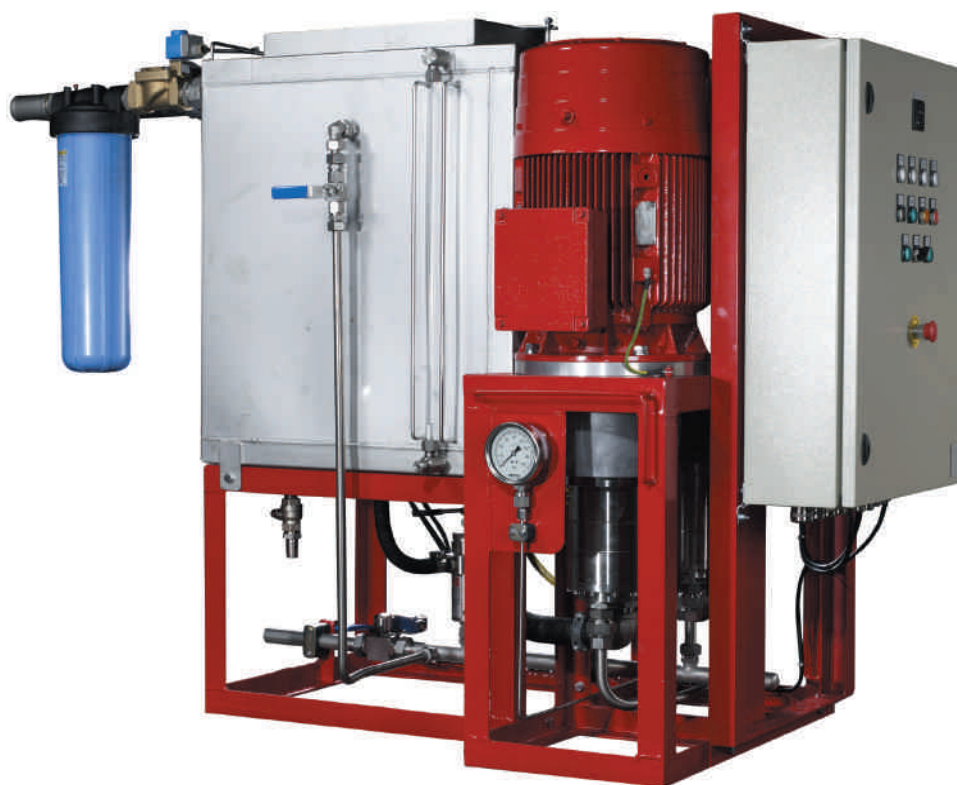
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High Pressure Water Mist improves Tunnel Safety

By Susan Bang

Danfoss Semco

More and more people are coming to a realisation that high pressure water mist is the answer to many safety issues. In particular, where there is a need to extinguish, suppress or control a fire without using chemicals or harmful gases.

Water mist history

The history of water mist goes back a long time, and brochures can be found describing water mist in the 1930s. The idea of water mist was revitalised in the eighties, with the Swedish company Electrolux as one of the pioneers. The modern concept of high pressure water mist spread from there to Finland and Denmark in particular, where some of the more significant pioneers of the technology are to be found.

The marine industry was quick to adopt this very effective and convenient new system, and new IMO regulations soon set the standard for tests and operational functionality. These marine standards are still the benchmark for all water mist applications, including those used on land. Industry has been slow to recognise the benefits of high

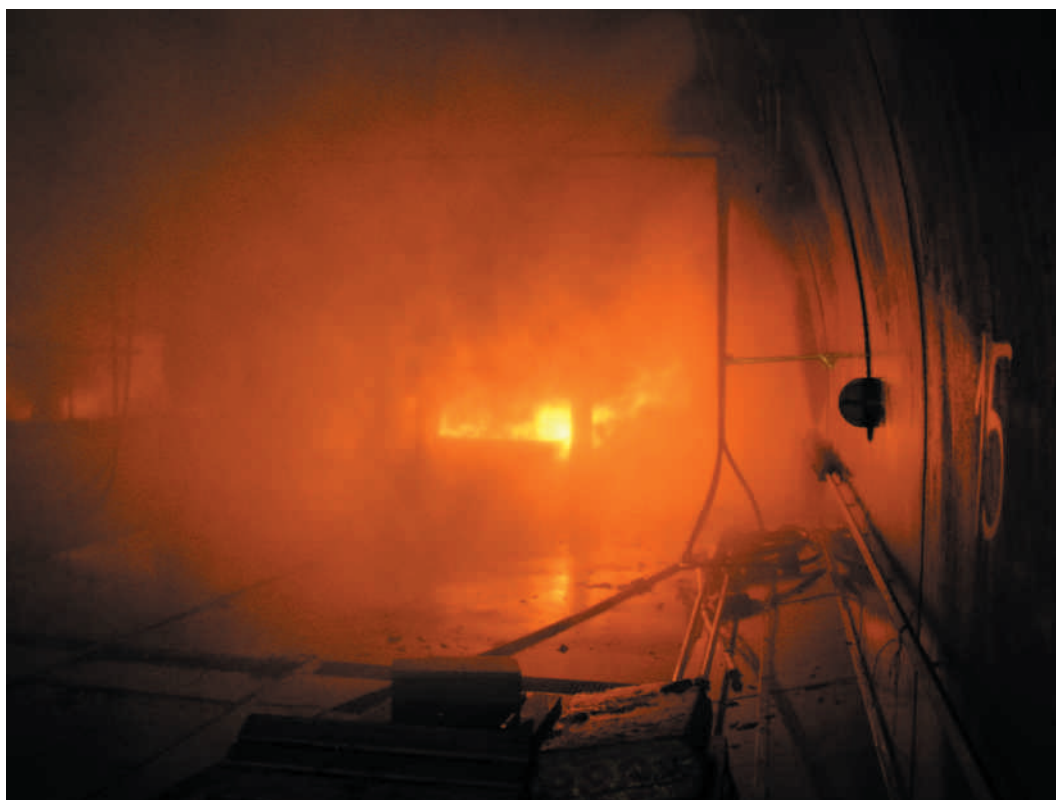
pressure water mist, although this situation is now changing. As a result, dedicated standards for land-based systems are now being developed, in support of the increased implementation of water mist applications in industry and construction.

Background

After several very bad tunnel fires in the late 1990s, with multiple casualties and millions of Euros of damage, tunnel safety became a major issue for several European governments. A series of programmes were initiated to investigate what might be done to improve tunnel safety.

I.e. the FIT European network on fire in tunnels ran from 2001-2004; UPTUN the best-known programme was an EU sponsored initiative that had a broad mandate to investigate tunnel safety from a

Sem-Safe high pressure water mist test, just after release of water mist.



variety of perspectives, and ran from 2002-2006. Wide-ranging studies were conducted on issues including concrete lining, human behaviour, detection, signals, signs, fire suppression and control, and more. Similar and complementary work was carried out under the 2004-2007 German SOLIT programme.

In 2004, EU directive 2004/54/EC became the first formal legislative document concerning tunnel safety across Europe. The directive was created in response both to the recent tunnel accidents and to the expectation of increases in border-crossing traffic across Europe. Personal unease at the prospect of entering a tunnel may also have contributed to the creation of the new directive.

The directive was not, however, very specific. Danfoss Semco believes it should be revised, taking into consideration the possibility of making the installation of an active fire control or suppression system compulsory.

The UPTUN programme

The UPTUN programme, or the 'tunnel programme' as it is often referred to, initiated a wide range of projects or work packages, among which was the work Package 2, WP2: "Fire development & mitigation measures".

Within this work package, an extensive number of fire tests were carried out to determine the nature of fire development. This included the size of possible fires, how smoke developed and the influence of ventilation. A standard fuel package was also developed, against which some actual fire suppressant systems could be tested as well as free burn fires.

Two manufacturers of high pressure systems and one low pressure system were tested against standard fuel packages in a test tunnel. More than 80 tests were performed and provided excellent data on comparative system performance and the

development of fires. The tests also provided invaluable results, data and experience to the scientists and test laboratories involved, as well as to the system manufacturers: knowledge and experience that would be difficult to achieve without the opportunity to participate in a programme of this kind.

As a conclusion to the test series, a real-scale fire demonstration took place in the VIRGOLO Tunnel in February 2005. All test participants were invited to take part in this demonstration, which conclusively proved the effectiveness of the high pressure systems.

The UPTUN guideline 251

The UPTUN programme produced excellent new knowledge and experience of fire development, fire mitigation, fuel packages, nozzles and equipment, smoke spread patterns and more. This valuable experience was subsequently condensed into a set of engineering guidelines: the UPTUN "Engineering Guidance for Water Based Fire Fighting Systems for the protection of Tunnels and Subsurface Facilities".

This document was created to convey some of the new knowledge to those who specify systems and equipment, as well as to share some of the experience with other manufacturers.

Key findings contained in the new guidelines

It is now understood that fires in tunnels can reach heat release rates of 100 or even 200 MW within a very short time. It is not hard to imagine the level of damage a fire of this intensity could cause to human life and the physical structure of the tunnel, as well as to the wider infrastructure. Such disruption may last as long as several years, and have a potentially major economic impact. Consequently, fires need to be detected as early as

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possible and a fire suppression system immediately deployed to at least control the fire.

Designing an appropriate fire suppression system

The research findings revealed the need for a 'sectionised' system, in which open nozzles form sections in the upper part of the tunnel, zones of at least 30 m in length and for the full width of the tunnel, from wall to wall. Each section should have its own section valve and be connected to the main supply line.

When the nozzles are located in the upper part of a tunnel, the risk of accidental damage to the nozzles is less than if they were located at the bottom part or even in the floor.

Closed nozzles with 'bulbs' were not recommended due to the extreme speed of fire development. The problem with using a nozzle that automatically responds to a sudden rise in temperature is that it may be triggered in the wrong area of the tunnel – simply as a result of hot air and smoke being spread by the tunnel's ventilation system – wasting valuable water supplies.

The research results also showed that pump unit(s) must be capable of supplying at least two sections of the tunnel simultaneously, on the assumption that the location of the fire and direction of fire 'downstream' can be determined.

Reservoirs for water should be of a volume that will supply water for at least 30 minutes for a tunnel less than 500 m long and 60 minutes for a longer tunnel.

Of paramount concern for the long-term safe operation of a given system is the quality of the components and materials used in its design. For example, the new guidelines indicate that materials used for water supply must be stainless steel of a quality not less than AISI 316 or, for filters and other parts, non-corrosive materials like plastic. Zinc-coated carbon steel or any other coating must not be used, due to the harsh tunnel environment.

For pump units and other components, extensive recommendations govern pump capacity,

power supply and design with jockey pump, section pumps, nozzles, and so on.

System reliability

One thing that is often overlooked in the design of fire control systems in tunnels is the adequate protection of the nozzles against the high levels of dirt found in the tunnel environment. The new guidelines recommend that each individual micro nozzle should be separately protected, rather than using one common cap for the whole nozzle. In the event that the mechanism fails to remove the protecting cap, conventional single-cap systems necessarily disable the entire nozzle. In contrast, by using individual caps for each micro nozzle, the failure of one cap would still allow the others to function normally.

Interfaces with other systems, for example monitoring, detection and ventilation, are essential for effective overall performance of the tunnel safety system. This need should be taken into consideration when designing systems.

All systems must be fully tested before they are formally commissioned, including the careful construction and assembly of all system components, and thorough flushing and pressure testing. Historically, these checks have not been rigorously enforced, and the new guidelines include recommendations for correctly completing these activities.

Project management

It is a major challenge to design, supply materials and components, and install a fire suppressant system in a tunnel. If the specified system needs to integrate with systems from other contractors, the challenge is even greater. It is one thing to have an excellent water mist system design, but quite another to be able to get the system into the tunnel and get it commissioned.

When a tunnel owner or operator chooses a system, consideration needs to be given to how the project should be managed and who is to undertake this key task. Experience has shown that coordinating several systems and contractors in a confined space like a tunnel, where it is critical to follow each construction phase to the letter and to make best use of each window of opportunity is not an easy task.

The more systems that can be managed by one organisation, the better. If the same organisation can be allowed to manage multiple systems, management complexity and coordination problems will be greatly reduced.

Any organisation tasked with managing a project as complex as the installation and commissioning of a tunnel fire safety system should have a proper project management tool box and extensive experience of managing similarly complex projects. Large tunnel or small, the size of the system is all that changes: the complexity of co-ordinating the installation of a water mist project stays the same.

Conclusion

High pressure water mist has developed from predominantly marine applications to a far wider range of uses, of which tunnel safety is one. In critical applications where safety is an issue for both life, property and the environment, high pressure water mist is often the very best solution. **APF**

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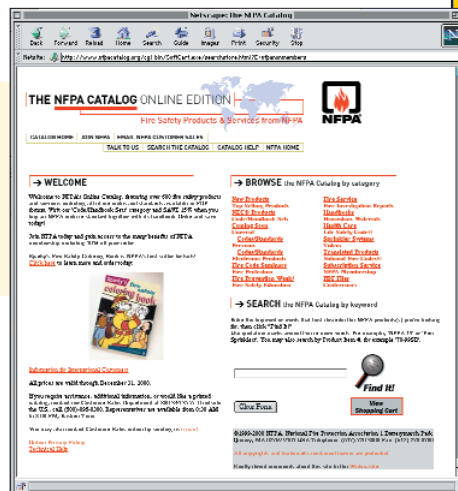
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The IVECO MAGIRUS Airport Reception Committee



Dragon x6

The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. IVECO MAGIRUS offers a world-wide unique product range for holistically covering all potential hazards that must be met on airports.

For the protection of buildings and facilities, IVECO MAGIRUS offers a wide range from command vehicles via first-intervention vehicles, light and special fire fighting vehicles to various different turntable ladders and aerial telescopic platforms with a rescue height of up to 54 m. Rescue vehicles and equipment carriers as well as swap body vehicles with a large roll-off container program complete the range.

With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this "top of the range" category, that will meet even the most specific requirements. Real power-houses in the form of currently unrivalled high-performing IVECO 1,024 hp or 1,500 hp engines with last generation common-rail injection technology do not only provide for an enormous acceleration but also for an enormous fire fighting power. Up to 10,000 l/min pump capacity, 14,000 litres fire fighting agents in a combination of water, powder, and foam as well as precise monitors with long throw ranges guarantee a fast and effective fire fighting operation.



Dragon x8

The excellent cross-country capabilities of these vehicles provide for an unrestricted mobility and ensure that fire fighting can also be effected away from the runway without any loss of time.

The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective alternative, e.g. for smaller airports. Based on highly cross-country capable, single tyre IVECO four-wheel-drive chassis, these vehicles are extremely mobile but nevertheless equipped with an impressive fire fighting power: depending on vehicle type up to 12,000 litres of fire fighting agent can be carried on board. This concept has been very much proven in practice as is shown by the more than 150 IMPACT vehicles that are currently in world-wide operational use at airport fire service departments.

Recently an IMPACT x6 (TLF 30/57-7-360) on an IVECO Trakker was delivered to the Adolph-Wuerth-Airport in Schwäbisch-Hall (Southern Germany). The vehicle features tanks for 5,700 l water and 750 l of foam compound as well as capacity for 360 kg of CO₂. The powerful MAGIRUS pump delivers an output of 3,000 l/min at 10 bar. 440 HP engine power enables speed on the runway; all-wheel drive and single tyres allow it to be extremely capable off-road.

Furthermore a lighting mast mounted on the rear of the vehicle with 2 x 1,000 W and a 13.5 kVA electric generator belongs to the vehicle equipment.

For the Schwaebisch Hall pump water tanker TLF as with all other IVECO MAGIRUS vehicles continuous operational preparedness is guaranteed: A network of Service stations in almost 150 countries around the globe is available round the clock.

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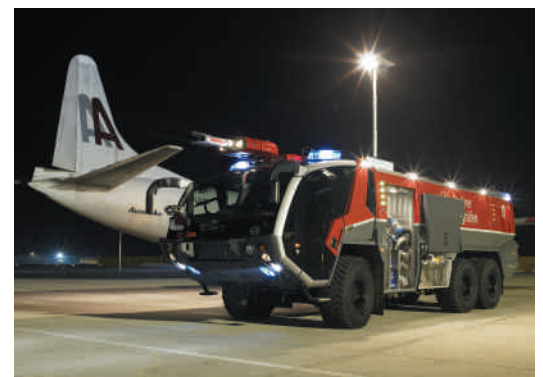
Rosenbauer – technological leader in ARFF vehicles

ROSENBAUER is the world's largest manufacturer of special fire-fighting vehicles. With its wide range of municipal fire-fighting vehicles and aerials built to both European and NFPA-Standards, its extensive series of air-crash tenders and industrial fire-fighting vehicles, advanced fire-fighting components and fire-safety equipment, Rosenbauer is the industry's "full-liner".

With its worldwide sales and customer service network, Rosenbauer is the partner for fire brigades in more than 100 countries. The technological leadership is underpinned by a tradition of innovation. Its central know-how lies in complex, custom-built fire-fighting systems and vehicles.

A vehicle for the 21st century

The latest innovation is the new Panther, the top model in the range of the world's leading manufacturer in the ARFF vehicle sector. The new Panther made its public debut at the "Interschutz" fire-fighting technology trade fair in Hanover in June 2005.



With this completely new Panther series, Rosenbauer has set another benchmarks in design and engineering and thus again strengthened its position as the technological leader in the global ARFF vehicle market.

The aim of the new development of the PANTHER 8x8 and 6x6 series was to orientate the vehicle more closely to the increases in airport traffic. The new vehicles are faster than their predecessors, can carry still more extinguishing agents and equipment due to higher

AIRCRAFT RESCUE FIRE FIGHTING VEHICLE ROUND UP



axle weights, are easier to operate than ever before due to the electronic control concept and already meet the exhaust emission requirements expected in years to come.

In addition, the latest PANTHER models have an innovative design language, which accentuates the vehicle's attributes of reliability, safety, power and dynamism. The Panther has already awarded with the international design labels "iF Product Design", "Red Dot" and "Focus Energy Gold".

A chassis in two versions

The 8x8 model comes with the new 1,000 hp MAN rear-engine chassis and automatic Allison gearbox, while the 6x6 model uses the 705 hp rear engine chassis manufactured by ROSENBAUER in the USA. With its eight powered wheels, operating weight of 40t, 14,500 l of extinguishing agents and a top speed of 135 kph,

the PANTHER 8x8 is the ARFF vehicle for planes with the dimensions of an Airbus A380.

Panorama vision from the cabin

The cabin of the new PANTHER disposes over a panorama windscreen made of composite safety glass and for the first time, the vehicle also has transparent doors. As a result of the enormous front and side panes, which have been extended both up- and downwards, the driver has an optimum view of the area surrounding the vehicle.

The futuristic instrument panel, with its indicator and operating displays conveniently located between the driver and co-driver, features a logic control system (LCS) which permits genuine "one-man operation" of the Panther's fire-fighting and vehicle systems. Another highlight of the development effort is the flap lids of the equipment lockers, which can now be opened pneumatically – from the cab.

High-performance, operational extinguishing technology

The PANTHER 8x8 has been fitted with the completely new RM60E roof monitor and the RM15E front monitor. Due to its high throughput capacity of up to 8,000 l/min at 10 bar and a throw distance of 95m, the RM60E roof monitor constitutes a significant vehicle innovation.

Safety requirements for the A-380

Dubai International is currently reckoned to be one of the fastest-growing airports in the world. The home airport of Emirates Airlines, which will be putting the new Airbus A-380 into service starting from next year, Dubai is working hard to be ready to meet the safety requirements for this extraordinary aircraft.

Having seen the new PANTHER generation demonstrated, and mindful of the need to ensure continued compliance with the stringent stipulations of the International Civil Aviation Organisation (ICAO) once the current airport extension project has been completed, the client made an immediate decision to purchase the new model.

The highest category of ICAO certification is mandatory before an airport can be approved for the Airbus A-380. ROSENBAUER's internationally acclaimed fire-fighting technology is considered to be the worldwide benchmark for airports aspiring to this certification.

For more information, please contact:

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SIDES – a UTC Fire & Security Company

Among the various vehicles available from SIDES and used in airports are Airport Rescue & Fire-Fighting Vehicles of the S3000/VMA series.

These are medium to large air crash tenders supplied with a Sides chassis, special high visibility cab and 4x4 or 6x6 drive configuration. All features necessary to cope with stringent standards and ICAO & NFPA requirements may be incorporated in this range that has been successful in more than 200 airports.

Automatic gearbox & power divider for pump and roll operation, rear mounted engine with easy access for maintenance, GRP tanks and body, long life suspension and excellent on and off-road capability are only some of the features appreciated worldwide.

The large cab having easy access can be mounted on all models of the S 3000/VMA series, with seating for up to 5 crew members. The driver's position is central and a coloured display, with graphics,



built-in LED indicators and controls, can enhance user friendliness with its micro-processor based system also capable of storing event data and keeping a log for maintenance operations.

The S 3000's low centre of gravity and excellent load distribution among the axles ensure stability and balance. The various configuration span from 4,000L-6,000L water for the 4x4 and up to 15,000 L for

the largest 6x6. Usually foam capacity will be at least 12% of that for water and vehicles are made to carry specified amount of powder or other extinguishing agents as well as gear & accessories according to airport safety category.

SIDES makes its own pumps, monitors and proportioning systems and thus ensures excellent compatibility and optimized design for its vehicles.

Variants to the standard units will include military versions, air transportability, and other engine and accessories options.

For more information, please contact:

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Z 8 - The ZIEGLER Flagship on Course of Success



The crash fire rescue vehicle Z8 of ALBERT ZIEGLER GmbH & Co. KG, Giengen/Brenz, is continuing its history of success. Since the first vehicle of this category was supplied almost 25 years ago ZIEGLER is handling more projects than ever. Among others are: 16 units for the German Armed Forces, 11 of them are in service already, 1 unit for Airport Zagreb, 8 units for Turkey, 1 unit for Airport Brussels, 3 units for Munich Airport. With these orders Ziegler prove again that the leading suppliers of the German fire brigades also find high acceptance in the tough international competition even in the King's class.

The Z 8 complies with and exceeds the ICAO-Recommendations.

As a basis for this crash rescue fire vehicle a MAN 8x8 chassis with single tires, MAN-V-12 Diesel engine with 735 kW (1.000 HP) is used. The vehicle with a total weight of 43,000 kg is suitable for interventions on off road terrain and it stands out due to extreme high driving performance. Maximum speed is approx. 140 km/h; for acceleration to 80 km/h less than 25 seconds are needed.

The Ziegler pump with a nominal output of 10,000 l/min at 10 bar is driven by a separate pump engine with 360 kW (480 HP).

Further components are a water tank with of 12,500 l, a foam tank of up to 1,500 l/min.; on request a powder unit or a CO₂ unit can be mounted. Output of the extinguishing agent is either made through the roof turret (approx. 6,000 l/min.), or the bumper turret. Optionally a telescopic boom with nozzle and piercing unit is available which is designed for the NLAs coming into traffic now.

The vehicle superstructure consists of driver/crew cab, pump and equipment lockers and water/foam tank. All components are mounted distortion-free on the chassis frame. Remarkable features of the superstructure in the patented ALPAS design are high flexural strength and

torsion-proof. Thanks to anodizing optimum protection against corrosion and a maximum degree of tightness and safety is reached.

The large canopy safety cabin manufactured in aluminium design provides a spacious working place with optimum view for 1+3 crew. Excellent features are protection against noise, heat and splinters and the strictly ergonomic arrangement of the control and monitoring elements.

Optional equipment: an automatic air conditioning system, heated seats cushioned pneumatically with integrated compressed-air breathing apparatus, heated outside mirrors as well as swinging doors operated

pneumatically opening ahead with swivelling treads for safe and easy access, even with breathing equipment put on.

The Z 8 sets standards in the electronic features. Thanks to the cross-linkage of the electrical components by CAN-Bus all driving and control operations for the extinguishing technology can be brought together, evaluated and automated. The various parameters of the extinguishing unit are shown in graphical displays. Thus, actual data are available for preparation, intervention, and for maintenance.

By these sophisticated features Ziegler provides a variety of advantages for the customer for being ready in case of emergency. Stuttgart Airport have procured four vehicles of this design, Zurich Unique Airport put five units into service recently and by the latest delivery end of 2006 Vienna International Airport operate a total of five Z8s now.

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Oshkosh® Striker® Aircraft Rescue and Fire Fighting (ARFF) Vehicle

The next generation OSHKOSH® STRIKER® aircraft rescue and fire fighting vehicles are a response to direct input from ARFF professionals. By better understanding the needs of its customers Oshkosh is uniquely poised to deliver vehicles that meet and exceed expectations.

The Striker vehicle combines rugged mobility with a smooth stable ride and easy operation. It's ability to outmaneuver and outperform any ARFF vehicle in its class has not only garnered it overwhelming respect, but a growing list of customers, including the U.S. Air Force, the New York Port Authority, O'Hare, Kuwait, Dallas-Fort Worth, Atlanta and Las Vegas International to name a few.

The Striker truck features fast response acceleration, unmatched visibility and triple agent fire fighting capabilities.

Designed to deliver unparalleled performance, safety and reliability, the Striker vehicle is the most advanced ARFF vehicle on the planet.

Unparalleled fire fighting performance is one of the most critical factors in the success of any mission. And the Striker provides wide variety of roof and bumper turrets, and the available SNOZZLE® high-reach extendable turret.

The Striker vehicle offers water tank capacities from 1,500 gallons all the way up to 45,000 gallons (17,033 l). Plus it's available with a dry chemical system including Hydro-Chem™ technology, a Halotron™ I clean agent system and up to 540 gallons of foam for triple agent capability.

The Striker truck also features Oshkosh's patented TAK-4® independent suspension

with dual control arms and single coil springs that delivers more than 16 inches of wheel travel while reducing stopping distances. The Striker truck also provides a full 17 inches of ground clearance and optional central tire inflation (CTI) system, mechanical rear axle steering and a semi-active suspension enhancement. Combined, these technologies allow for excellent off-runway airport response.

Safety is one of Oshkosh Truck's core values, and the Striker truck's list of safety features is extensive. The vehicle offers tremendous forward, upward and lateral visibility with more than 80 square feet of glass for a panoramic view of the scene. The cockpit features seating for up to five fire fighters and a centrally located driver's position. The wraparound cockpit-style dashboard puts jet fighter-like, point and shoot turret



joysticks and other controls within easy reach of the driver for comfort and efficiency. The company even offers its own proprietary ARFF Driver-Safety classes, designed to improve the skills, confidence and safety consciousness of every firefighter who gets behind the wheel.

Unmatched reliability is another

hallmark of the Oshkosh Striker vehicle. The chassis has a proven track record for durability and strength. The Striker chassis also features the TAK-4 independent suspension and rugged Oshkosh® front and rear axles. Plus, Oshkosh backs the Striker vehicle with a 24-hour, 7-days per week global support network. The company also offers on site maintenance classes for airport mechanics.

In short, the Oshkosh Striker is built to give firefighters everything they need to protect the airports

they serve and respond with full force.

For more information, please contact:

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WI 54903-2566, USA

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Unifire AB (Sweden)

UNIFIRE AB announces that Crash Rescue Equipment Services, Inc. (Crash Rescue) has selected the Unifire Force series monitors for their aviation and industrial fire fighting products.

Unifire, of Sweden (www.unifire.com), has manufactured high quality nozzles for firefighting and industrial applications for over 35 years. In recent years, Unifire has taken its expertise in nozzle design and construction and applied it to develop unique, stainless steel, remote-controlled, electric monitors – the Force50 and Force80.

Crash Rescue, of Dallas, Texas (www.crashrescue.com), specializes in the remanufacture and support of all types and brands of airport firefighting equipment, as well as the manufacture of the Snozzle and other unique ARFF vehicles and equipment.

Crash Rescues first application of the Force series monitors has been on the new 65 ft. (19 meter) aerial water tower – Snozzle. Two Snozzle models have been designed: Hydra-Sword for municipal and industrial fire apparatus and Model 652 for Aircraft Rescue Fire Fighting (ARFF) vehicles. These aerial devices are unique in that they have two monitors, each operating at different levels.

At the tip of the Snozzle, the Unifire Force50 is located at the 65ft (19 meter) level and flows up to 500 gpm (1,900 lpm). It can be maneuvered into small openings for more precise interior fire fighting. This allows the Hydra-Sword to get through doorways and windows of a

building, and the 652 can get through the over wing exits of an aircraft with ease. The base nozzle, the Unifire Force80, is located at the 50ft (15 meter) level and flows up to 1,500 gpm (5,600 lpm).

The Hydra-Sword model has a number of unique characteristics. The unit is light weight and mounts midship behind the vehicle cab. It is the lightest 65ft (19 meter) aerial device on the market. It does not require a torque box sub-frame, thus allowing for installation on a standard fire apparatus chassis. The location of the apparatus firepump, compartments, water tank and hose bed are unaffected. Both the Unifire Force 50 and Unifire Force 80 nozzles can be used simultaneously thus directing fire fighting streams on two or more locations. All Hydra-Sword models utilize radio remote controls.

The stainless steel 316 construction of the Unifire Force monitors makes them light weight, highly resistant to corrosion, extremely durable, and ideal for the foam agents discharged through the nozzle. Also, the unique proportional speed control of the Force monitors movement adds a new level of precise control for these large master streams. The program feature of the Force monitors allows the operator to record a range of motion as well as spray pattern and then have the monitor and nozzle repeat the sequence indefinitely. This is ideal for protecting exposures. In addition, the Force monitors control system utilizes CANBUS technology, which makes installation simple, reduces wiring requirements, and allows



for custom controls not only of the monitor and nozzle, but also of additional devices. Each monitor can be controlled by multiple joysticks, or a single joystick can control multiple monitors. The monitors can even be controlled by a computer network. Unifire offers its Force monitors with an optional progressive radio remote control with international approvals, allowing the operator to precisely control the monitors while away from the vehicle.

For more information, please contact:

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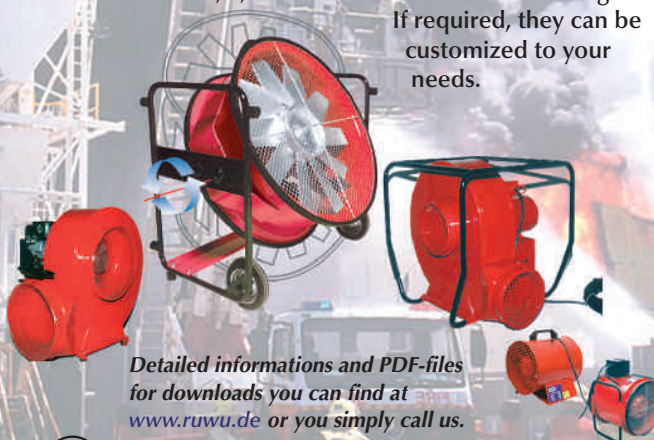
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PPV Basics – One of the most powerful tools in any fire departments arsenal is their ventilation equipment. Ventilation is essential not only for reducing property damage after the fire is extinguished, but even more importantly for improving life safety for both the firefighters and any victims of the blaze.

It is this key element, Life Safety, which has driven many departments to address the manner in which they ventilate on the fire ground. Using a fan to blow into a structure defies most sound firefighting theory. But it was found that the air did not have a significant effect on fire behavior. Similar to a typhoon, oxygenated air is drawn in low and heated combustion products are expelled upward. The fan, if set right next to the seat of the fire would greatly increase combustion. But when the fans energy is spread out over the entire room, it only has enough power to create a steering force on the combustion products, much the same as a weather front might steer a typhoon (figure 1). Departments new to PPV should, at first, only use it after the fire has been extinguished. This will help them to gain knowledge that can then be taught during training. To effectively use PPV as a fire department requires that a majority of the



Figure 1

firefighters understand the concept and have been allowed to train with it prior to utilizing it in an actual fire. Always remember these basics when ventilating on the fire ground:



Figure 2

- 1 Never Use PPV in a Backdraft Situation (fire starved for Oxygen)
- 2 Never Use PPV if there are people (victims or firefighters) between the seat of the fire and the exit opening.
- 3 Open the exit opening prior to using the PPV fan to pressurize the structure
- 4 Coordinate the ventilation with other fire ground activities
- 5 Always open and check for fire extension after main knockdown

Positioning PPV Fans – Early in the adoption of PPV technology, there was great emphasis on sealing the door. The entire cone of air was supposed to cover the entry location. This generally caused the fan to be set > 3 meters from the entry door. With much work and testing, it has been found that PPV can be very effective with closer placements and the “seal” being formed inside the structure. This allows PPV to be used in situations where there is a smaller area near the entry (figure 2). It is common to set units as close as 1 meter and provide very effective air movement. These close sets may be required on dwellings that have a small porch or a narrow hall way at the entry.

Placement of multiple PPV fans is now much better understood also. The use of a “V” attack (figure 3) increases the flow of air into the building to more quickly ventilate any contamination. It also allows the hose lines and firefighters to move straight into the building. This parallel set is much more effective in ventilation of structures than older series set with two fans in series (figure 4).

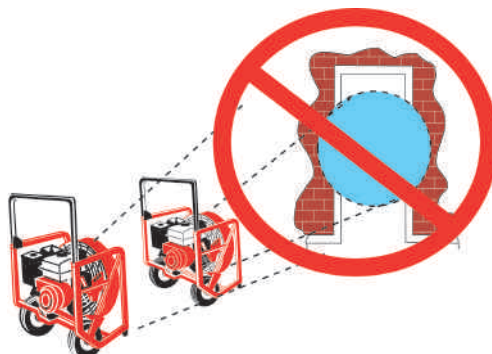


Figure 4

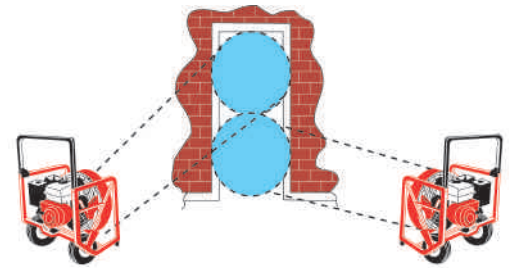


Figure 3

Just as using two pumps in parallel moves more water onto the fire, two fans in parallel moves more air into the structure.

Care should be taken on tilting fans with petrol engines. Engine manufacturers design with a maximum tilt angle of 20°. This is due to the design of the oil pan and lubrication system. Most PPV fan manufacturers respect that limit and may add a degree or two of safety factor, since the unit may be set on a surface with a slight slope for drainage. Do not allow firefighters to crib the fan to greater angles by placing wooden blocks or other materials to steepen the fan angle when using petrol driven fans. Electric PPV fans can be cribbed to greater angles with no problem except the stability of the unit.

Weather – Wind plays a big role in how effective your department can be when utilizing PPV technology. In general, PPV will not be very effective in wind speeds over 20 kph. In higher wind speeds, it is best to use the wind to your advantage. No wildland firefighting is done from the downwind side and this is also true for structure firefighting in high wind. As wind speed increases, it is best to make smaller exit openings or to move air at angles to the wind direction. It is physically impossible to overcome high natural wind speeds with a small portable fan.

Extreme cold does not negatively impact the effectiveness of PPV, but it can create freezing problems in the structure. This is not a problem in large fire, but could be on more routine ventilation situations. If someone has a small kitchen fire on the stove, do not over-ventilate causing the water pipes to freeze.

Special Situations – The situations below require a better knowledge of PPV use and how to position fans for maximum effectiveness. If your department does not currently use PPV for ventilation, it would be best to not attempt the situations below. All of the following situations are greatly enhanced if you use existing ventilation systems whenever possible.

High Rise Ventilation – One of the most powerful applications of PPV is its use to maintain the conditions of stairwells. Stairwells are the main arteries of high rise buildings. They are the means of egress for the occupants and the means of



Figure 5

ingress for the firefighters. Many buildings have pressurized stairwells built into them. The use of PPV can assist in this pressurization or perform the task for systems that are not functioning due to fire conditions. To properly perform ventilation in a high-rise full of people, many firefighters are needed to police the ventilation corridors and prevent occupants from inhibiting ventilation by other opening doors and windows. As with all firefighting situations, high-rise ventilation should be constantly monitored for effectiveness. If it is not working, evaluate the overall situation and correct the problems.

Basements – Basements and other below grade situations can pose challenges to effective PPV fan placement. Generally, the problem is finding an appropriate outlet or enough outlet area. A common mistake is trying to place the fan so it is blowing directly down the stairway. It is perfectly acceptable to place the fan blowing into the front doorway, making sure the door to the stairway is held open, and there are adequate openings in the basement windows. This situation requires good coordination so other firefighters do not open other windows or doors. If this happens, the air will take the easiest route out of the structure, severely decreasing the effectiveness of the basement ventilation. If there are no other openings in the basement, either cut an opening in the floor to provide one, or use flexible ducting to provide one (figure 5).

Large Commercial Buildings – Generally, large commercial buildings can be ventilated exactly the same way as smaller homes. The problem usually is the size of the PPV fan compared to the expanse of the building. The easiest solution is a very large fan (figure 6). However, it is still possible to ventilate large buildings with multiple small fans. Garage doors can be propped open ½ way, with 2-4 fans blowing into the opening created (figure 7). This can be done at more than one position for an even greater effect. Another problem with large commercial buildings is with the high ceilings. The best solution is to create openings in the ceiling (smoke vents, roof access doors, or other normal openings are best). If there are no openings in the ceiling, prepare for



Figure 6

a long wait until the structure is fully cleared.

Implementing PPV – The use of PPV for fire ground ventilation can be phased in over time. It is important that a department practice with PPV after the fire before using during a fire. As confidence is gained, the instructors can start teaching PPV to various groups within the department. If they only teach the incoming rookies, those rookies will get on a fire scene and be overruled by the veterans. So instruct an entire group on PPV technology. Let them play with various scenarios. Time the ventilation of fake smoke with the veterans' method, then with PPV. The goal of a progressive department is to save as many lives as possible in the most difficult situation. By effectively using PPV in an aggressive manner, lives can be saved. Firefighters can avoid calling in the RIT team because they can see the buildings layout as they go in. PPV can also help in property conservation by allowing firefighters to quickly find the seat of a smoldering fire. Structural firefighting will always be one of the most dangerous situations faced during your career, so use all of the tools available to make it easier. **APF**

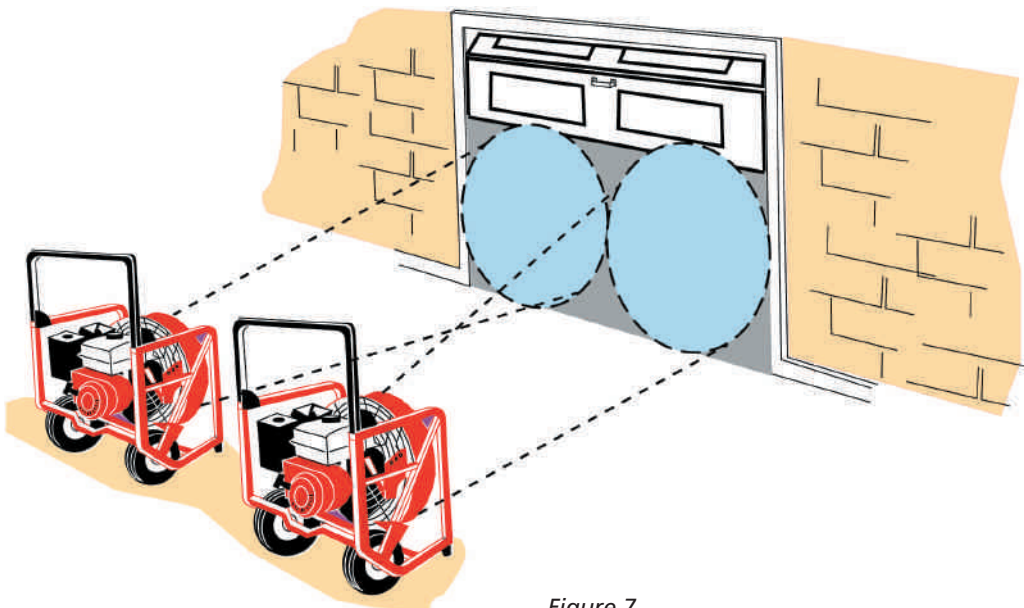


Figure 7



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Foam Story Goes On!

For the past few years, fire fighting foams have come under scrutiny from various scientific laboratories in order to provide a better understanding of their impact on the environment. Originally, it was assumed that they were environmentally safe without fully appreciating the potential detrimental effects of releasing them to land or water.

In May 2000, evidence revealed that PFOS – the major residue from 3M's AFFF range – had a unacceptable PBT (Persistent, Bioaccumulative, Toxic) profile. Since then, most countries, including the European Union, have enacted regulations to restrict or ban the use of PFOS-based compounds; thus PFOS is no longer a concern but history.

Following the breaking of this news from 3M, other foam manufacturers claimed that they were not concerned as they were using alternative compounds known as fluorotelomers. As of today, fluorotelomers are still the technical answer for manufacturing AFFF.

Most countries, including the European Union, have enacted regulations to restrict or ban the use of PFOS-based compounds

In the past six years, scientific studies have concluded clearly that the degradation products of these so-called safe alternatives are Very Persistent and Bioaccumulative. One predominant compound PFOA has been proven Toxic, and a high suspicion of toxicity hangs over H-PFOS and PFHxA, which are nowadays major residues from AFFF degradation. In fact, no scientific evidence has ever proven positively that the alternative is safe.

Ultimately, a scandal emerged in Germany in mid-2006. A study conducted

under the authority of the Federal Environment Agency threw up evidence that breast milk was heavily contaminated with PFHxA, which meant that mothers were feeding their new-born babies and poisoning them at the same time! Growing pressure from German politicians is now demanding a total ban on these chemicals. It is noteworthy that PFHxA indicates in a rather obvious manner direct pollution from degradation products of fluorotelomers such as those used in fire fighting foams.

Lacking evidence of safety, one should be very cautious about claims that AFFF is safe. The best option should be to select fluorine-free foams whenever possible. From this starting point, we will consider two types of fires. The most common type of fire are those involving

class A materials; these represent more than 95% of total fire interventions and are usually tackled by Fire Brigades. BIO FOR is the perfect answer for these risks. It meets relevant standards for the extinction of fire involving solids and has been proven to be more efficient than common foams on these fires; it can be used for a wide range of applications and is 100% fluorine free. Thus it will leave no persistent residues.

The second type of fire are industrial fires involving liquid hydrocarbons – class B materials. ECOPOL has been developed to address these risks. Fully biodegradable and fluorine-free, it meets the EN 1568 standard for both oil and chemical fires.

These two Fluorine Free Foams have been extensively tested by the Hygiene Institute at Gelsenkirchen (Germany). Results clearly indicated that these foams were fully biodegradable, non-toxic and that they were safe for use at the recommended rate of dilution. Now we have safe products and can decide to choose this new generation of foams – for our environment, for our safety, for our children. The choice is entirely yours.

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Tyco Foam Concentrates meet markets' expectations



TYCO's Finiflam® and Tutogen® foam concentrate brands are being heralded by the company as meeting the needs of firefighters who are unwilling to compromise on foam quality. The Finiflam concentrates are designed for marine, airport and offshore installations; heli-decks; sprinkler systems; process plants; storage tanks; pumping stations, and for use with non-air-aspirating hand nozzles. Tutogen concentrates are targeted specifically at fighting Class B hydrocarbon fires involving crude oil, petrol diesel and aviation fuel.

Finiflam, an AFFF [aqueous film forming foam] concentrate, is available in six variants: Finiflam A3F 1% EN; Finiflam A3F 3% EN; Finiflam A3F 6% EN; Finiflam A3F 3% EX; Finiflam A3F 6% EX; and Finiflam A3F 3% LU. All are based on fluoro-surfactants, hydrocarbon tensides and glycolethers. The Finiflam EN concentrates are approved to EN 1568-3, while the UL concentrate is Underwriters Laboratories approved. Tutogen is a fluoroprotein foam concentrate that is a combination of fluorochemical surfactants, hydrolyzed proteins and anticorrosion agents. Four options are available: Tutogen FP 3%

EN; Tutogen FP 6% EN; Tutogen FP 3% EX, and Tutogen FP 3% UL.

Both concentrates are designed to be used with a variety of conventional equipment. This includes: balanced-pressure and in-line balanced-pressure pump proportioning equipment; balanced-pressure bladder-tank-type proportioners; around-the-pump proportioners; fixed and portable in-line venturi proportioners, and fixed and hand-line nozzles with fixed induction/pick-up tubes.

The foam produced by Finiflam concentrates extinguishes hydrocarbon fires by direct and indirect application. An aqueous film is formed on the surface of spills and larger hydrocarbon fires, covering the fuel and preventing hydrocarbon evaporation. Finiflam ensures excellent burn-back resistance, and holes in the foam blanket caused by raindrops or gusts of wind are quickly resealed by the spreading aqueous film. The foams can be used with all foam-compatible dry chemical extinguishing powders, and sea water can be used without any increase in the application rate.

Tutogen is claimed by Tyco to be the ideal foam for sub-surface injection systems – a technique pioneered by

SKUMTM – due to its resistance to the hydrocarbon pick-up effect. It is said to be ideal for extinguishing medium polarity flammable liquids, such as toluene, xylene, phenol and acrylonitril. Its wetting characteristics also make it suitable for fighting Class A fires. Among the many advantages claimed for it over conventional protein concentrates are its higher burn-back resistance due to its lower fuel pick-up, faster extinguishing, and improved compatibility with sea water. Also, the foam is not damaged by its plunge into the burning fuel, which inevitably occurs when the foam is not gently applied, as is the case with monitors or hand nozzles.

Tyco has published a series of product datasheets on the Finiflam and Tutogen concentrates. They are available by email on tspmarketing.emea@tycointl.com, by telephone on +49 (0)221 67 850, or by fax on +49 (0)221 67 85 207.

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Petroseal is a Film-Forming Fluoro-Protein (FFFP). It is the only type of fire to successfully combine the rapid flame knockdown of conventional film-forming foams like AFFF with the high levels of post-fire security that are unique to FluoroProteins. This post-fire security is essential in protecting fire crews from the dangers of sudden and unexpected re-ignition and burn back during rescue operations.

Petroseal passes the most stringent performance requirement "Level B" of



the International Civil Aviation Organisation (ICAO) foam standard, it is Listed by Underwriters Laboratories Inc. in the USA and it fully complies with the requirements of the UK Ministry of Defence Standard 42-40. Petroseal is also manufactured to BS EN ISO 9001:2000 Quality Management Systems.

Based on a natural protein and free of PFOS and synthetic detergent, Petroseal has excellent environmental credentials. It is available in 3% and 6% grades and is readily proportioned using conventional foam proportioning equipment. It can

be applied with standard non-aspirating discharge devices such as spray/fog branchpipes and nozzles as well as low and medium expansion branchpipes.

The unique formulation of Petroseal means that it can be used at temperatures as low as minus 15°C and is unaffected by repeated freezing and thawing. Exceptionally stable in long-term storage, it has a shelf-life of at least ten years.

Reduced stocks, low cost storage, long shelf-life and low usage levels all combine to make Petroseal the most cost-effective fire fighting foam currently available to aviation fire fighters.

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Airport firefighting

There is no room for error when fighting fires in airports, with the life risk involved everything must run smoothly otherwise there could be dire circumstances. Airport fire fighters constantly train and have to prove their competence to ensure that the chance of any mistakes are eliminated but "sods law" states that anything can happen and often does and normally at the worst time.

When it comes to using foams, fire fighters need to be confident that they will do what they are intended to do, every time, without fail but not all firefighting foams are the same.

Foams that contain proteins like FP and FFFP start to degrade as soon as they leave the factory so if they are not stored properly or tested regularly it could be that they are below specification. Foam inducing equipment such as 'around the pump proportioners' are checked regularly. But what if something simple, like not being flushed properly after use, allows sediment to build up in the valves and prevents them from operating correctly? Perhaps an inexperienced pump

operator sets up the proportioning system incorrectly and delivers foam at less than 3% or perhaps the new recruit plunges a jet of foam into a spill fire and does not apply a foam blanket using a more gentle application allowing a lot of fuel pick up. All these things mean that a fire fighting foam is being asked to do more than is normally expected and may cause them not to work as expected.

What is needed is a foam concentrate that can withstand such harsh treatment, a foam with "Built in safety". The Arctic Foam AFFF range has just that, a "built in Safety" that means regardless of the mistakes made by operators and regardless of poor maintenance it will always



work. It makes no difference if the foam is abused in storage or if the fire fighter does not induce it at the correct rate or if the inexperienced fire fighter makes a mistake Arctic Foam AFFF will always do the job that it is designed to do it will always extinguish fire very rapidly and will secure post fire spills.

Airport fire fighters need all the help they can get and having an Arctic Foam AFFF available will always give them the confidence that they will succeed regardless of what "sods law" might throw at them.

For more information, please contact:

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General Sales & Marketing manager

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The Thermal Imaging Camera:

A look at the past, present and future

By Paul Spooner

Product and Marketing
Manager,
E2V Technologies

The world we live in is a high speed, high tech environment; every day brings new products or applications that are designed to make our lives easier and more efficient, for example the advancements in portable phones and hand-held computers means that our lives have taken on a fluid and instant quality.

Access to a wealth of information is only a touch of a button away regardless of whether you are sat at a desk or on the move and gone are the days of calling someone from a fixed telephone line, today we can choose from several different communication methods to instantly communicate with family, friends or colleagues anywhere around the globe.

This unstoppable progression in technology infiltrates all areas of life and the firefighting

industry is no exception, we have all become part of the technology revolution, embracing change and looking out for the next product that will improve our lives and our jobs.

Over the last twenty-five years the thermal imaging camera has evolved continuously. Ever since e2v's (then EEV) introduction of the first hand held Thermal Imaging Camera (TIC) for fire fighters in 1981, there have been many changes. Although a revolutionary invention, the first



cameras were also large, heavy, in-flexible and by today's standards, very basic. They used pyrelectric vidicon tubes, which were fragile and offered poor performance, in modern day TICs all cameras use solid state Focal Plan Arrays (FPAs) making them strong enough to cope with the harsh environment and handling, synonymous with firefighting.

These advancements have happened thanks to the de-restriction of the technology from military use, to dual use, which allows the detectors to be used in commercial products. Although some restrictions still apply, the majority of Fire Brigades around the world are now able to purchase these pieces of life saving equipment.

With each new product the expectations of the end user has increased and the environments the cameras have to survive in have become even

more varied. Where once a simple point and view camera was all that was needed, the end-user now wants, and needs, more advanced functions and features. Customer demand has meant that we have seen the cameras slowly get smaller and lighter, and as technology has advanced, new features have been introduced to make the camera easier to use; LCD viewing screens, colourisation (today, all cameras have colour schemes to provide

Although some restrictions still apply, the majority of Fire Brigades around the world are now able to purchase these pieces of life saving equipment.

the user with the ability to detect the spread of the fire, first introduced on the Argus3 camera), image capture, remote video transmission, temperature measurement and digital zoom are common offerings in the modern camera.

Thermal cameras today mainly use Microbolometer technology detectors based upon Vanadium Oxide (VOX) or Amorphous Silicon (ASi) sensing materials. ASi has always been perceived as having the poorer performance compared to other technologies, but recent progress has



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allowed improvement in the performance to nearly match that of the VOX detectors.

To meet these customer demands TIC manufacturers use state-of-the-art detectors and design the electronics and software to produce the highest levels of performance.

Essential features for current firefighter thermal imaging cameras include:

Thermal cameras today mainly use Microbolometer technology detectors based upon Vanadium Oxide (VOX) or Amorphous Silicon (ASi) sensing materials.

- **Durability**

The ability for the camera to be dropped without damage or loss of functionality. The cameras have to be light enough to held in one hand but rugged enough for the tough environment.

- **Environmental**

Must withstand low and high temperature exposure and be submerged to a depth of 1metre without water ingress. Temperatures at a fire scene can reach over 500 degrees centigrade and although the cameras will not reach these temperatures they must be able to be resistant.

- **Performance**

The camera has to reach highest levels of performance for battery life, picture quality and dynamic range. The camera's software has to be able to:

- Constantly monitor and control the internal temperatures
- Be able to react to external conditions to allow the best possible picture quality at all times.

Future advancements in thermal imaging camera technology will be influenced by the reduction in price and size.

The progress we have seen in the market to date has included:

- **Smaller pixels sizes**

This has created detectors that have smaller packages and higher resolution. For example: pixel size of less than 25microns from 55microns and resolutions from 160 x 120 pixels, up to 640 x 480 pixels.

- **Performance improvements**

The minimum discernable temperature difference of the original pevicon tube based cameras was approximately 0.3°C (300MK), whereas the performance of the new sensors sees this value reduce to 0.05°C (50Mk).

- **Dynamic Range**

The dynamic range of a camera is the range of temperatures the cameras can see. With pevicon tube cameras this range was limited was 400°C, today that range can be in excess of 1000°C.

The trend in previous years was to use smaller format array detectors but in recent years larger formats are being used. This has come about by the reduction in pixel size, the ability to produce the detectors at the same prices as the smaller formats. The markets have opened up outside the fire market meaning the detectors are produced in larger quantities and the fire camera manufacturers are seeing the benefit through reduction of price based upon economy of scale.

Currently Helmet mounted cameras are being developed with good resolutions and applications, advances will continue in this area to make smaller, lighter products with continuous improvement on



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resolution and picture quality. The benefit of helmet mounted cameras is that the firefighters hands are completely free, they don't have to worry about holding the camera or the possibility of dropping it, also removing the need for a separate cameraman allows firefighters to find the victim or partner and exit quickly without using reference points, which could slow the rescue down, the disadvantages with current models are that they are found to be cumbersome and image can be lost through fogging of the firefighters mask, also the helmet tends to move around, requiring constant adjustment.

**Looking further into the future,
the possibility of a 'Heads-up'
display on the firefighters BA
(breathing apparatus) mask is
certainly a potential.**

Future advancements in thermal imaging camera technology will be influenced by the reduction in price and size. As these factors come down, the personal camera could soon become a possibility. The personal camera could become small enough and cheap enough for every firefighter to have one as part of their basic kit, removing the need for a separate cameraman. The challenge with the personal camera is designing something that can be stored on the firefighters uniform neatly and easily when not in use, so that it doesn't hinder a rescue where the firefighter will need both hands free.

Looking further into the future, the possibility of a 'Heads-up' display on the firefighters BA (breathing apparatus) mask is certainly a potential. In this instance the visual would be transmitted from a miniature camera to the mask, projecting a

colour image right in front of the firefighters eyes. The advantages to this technology are; that it would be hands free enabling the firefighter to use the thermal camera at all times, even when exiting with a casualty, there would be no cumbersome apparatus to attached to the helmet which has the possibility of falling off, finally the problem of constant adjustment could be removed as the mask would be in a fixed position on the face.

Another serious consideration for thermal imaging camera manufacturers looking to bring new products to market are the Environmental considerations that must now be undertaken. In Europe the Reduction of Hazardous Substances directive (RoHS), outlines the restriction of the use of certain hazardous substances in electrical and electronic equipment. This Directive bans the placing on the EU market of new electrical and electronic equipment containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants. This means that all new Thermal Cameras have to be compliant with the RoHS directive. Although some manufactures are selling product under exemption, eventually all electronic and electrical equipment sold in Europe will have to be compliant. This directive, or forms of it are being introduced throughout the world. Japan and China have their version of the directive and in certain states in the USA this directive is being actively investigated. This directive was a major consideration for e2v when developing the Argus™4 and is the first compliant Thermal imaging camera.

Thermal imaging camera's have come a long way since they first came on the scene, they are smaller, lighter and the picture quality has improved ten fold. The camera of the future is yet to be decided, but one thing is certain, progress cannot be stopped.

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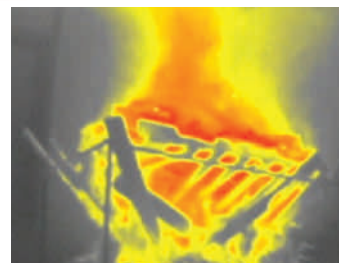
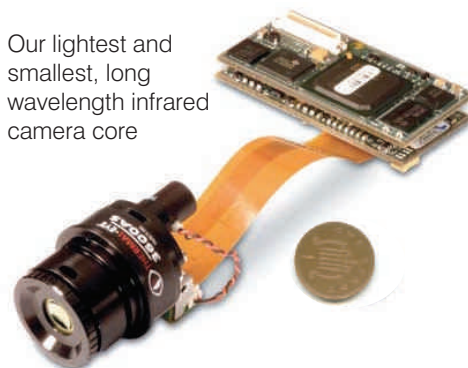
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Plot 35 Chandivali Village, Off Saki Vihar Rd,
Mumbai 400 072, India
Tel: +91 22 28475488
Email: vijaysabre@vsnl.net
Dealer/Distributor

INDONESIA

PT BUMI CERAH AGUNG

Komplek Karang, Anyar Permai, Jl Karang Anyar
No 55 /C1-17, Jakarta 10740, Indonesia
Tel: +62 21 6246954
Email: rudybca@centrin.net.id
Dealer/Distributor

KOREA (SOUTH)

JIN-ASIA CORPORATION

889-3 Daedae-Ri, Unghon Myun, Ulzoo-Kun,
Ulsan City, South Korea
Tel: +82 52 221 9871
Email: jinasia@nownuri.net
Dealer/Distributor

MALAYSIA

DASAPREM (M) SDN BHD

10 & 12 Jalan Muara 8/9, 4000 Shah Alam,
Selangor, Darul Ehsan, Malaysia
Tel: +60 (3) 551 00957
Email: dasaprem@dasaprem.com
Dealer/Distributor

NEW ZEALAND

CHUBB FIRE & SAFETY PRODUCTS

3 Fisher Crescent, Mt Wellington
Private Bag 9220, Auckland, New Zealand
Tel: +64 9 270 7234
Email: Daryl_Brown@chubb.co.nz
Dealer/Distributor

SINGAPORE

PROGRESSIVE INDUSTRIAL EQUIPMENT COMPANY

24 New Industrial Rd
#02-08 Pei Fu Building, Singapore 536210
Tel: +65 6282 7722
Email: pie@pacific.net.sg
Dealer/Distributor

PHILIPPINES

ALLIANCE INDUSTRIAL SALES

Unit 109, Cluster 3, Makati Prime City, 7708 St Paul Road San Antonio, 1203 Makati City, Philippines
Tel: +632 890 8818
Email: alliance8_jcy@pacific.net.ph
Dealer/Distributor

TAIWAN

SECOROC CORPORATION

219 Chung Cheng North Road
San Chung City, Taipei Hsien, Taiwan
Tel: +88 2 8985 3838
Email: secoroc@ms21.hinet.net
Dealer/Distributor

THAILAND

CHASE ENTERPRISE (SIAM) CO LTD

497 Phrapinklao Road, PO Box 7-67
Bangyeeekhan, Bangplad, Bangkok 10700, Thailand
Tel: +66 2 883 2880
Email: chase@loxinfo.co.th
Dealer/Distributor

KERR

AUSTRALIA

FIRE RESPONSE PTY LTD

PO Box 668, New South Wales 1730,
Seven Hills, Australia
Contact: Geoff Marchant
Tel: 0061 02 9838 9044
Fax: 0061 02 9838 9071
Email: firemail@firerresponse.com.au
Dealer/Distributor

HONG KONG

ON MAN SAFETY EQUIPMENT CO

6/F Block F1, Hong Kong Industrial Building
444-452 Des Voeux Road, West Hong Kong
Contact: Micheal Lui
Tel: 00852 254 72658
Fax: 00852 254 72674
Email: miclui@ctimail3.com
Dealer/Distributor

INDIA

NITIN FIRE PROTECTION INDUSTRIES LIMITED

501, Delta, Technology Street, Hiranandani Gardens, Powai, Mumbai 400-076, India
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Tel: 0091 22 2570 0392
Fax: 0091 22 2570 1110
Email: shelarv@nitinfire.com
Dealer/Distributor

MALAYSIA

DASAPREM (M) SDN BHD

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Selangor Darul Ehsan, Malaysia
Contact: T.D. Murthy
Tel: 00603 5510 0957
Fax: 00603 5510 4486
Email: dasaprem@yahoo.com
Website: www.dasaprem.com
Dealer/Distributor

NEW ZEALAND**PSL**

PO Box 69-028, 10 Akatea Road
Glendene, Auckland, New Zealand
Contact: Anne Hadfield
Tel: 0064 9 818 8048
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Email: anne@firemaster.co.nz

Dealer/Distributor**THAILAND****THE EAST ASIATIC (THAILAND)
PUBLIC CO LTD – EAC**

1168/98-100 Lumpini Tower, 33rd Floor,
Rama IV Road, Kwang Thungmahamek,
Khet, Sathorn Bangkok 10120, Thailand
Contact: Patcharaporn S.
Tel: 0066 2689 5999
Fax: 0066 2689 5888
Email: patcharaporn@eac.co.th

Dealer/Distributor**KIDDE FIRE
PROTECTION****AUSTRALIA****KIDDE AUSTRALIA PTY LTD**

Street Address:
314 Boundary Road, Dingley Vic 3172
Mailing Address:
PO Box 682, Braeside Vic 3195
Freecall (Australia): 1800 672 171
Tel: 03 9518 5588
Fax: 03 9518 5577
Email: info@angusfire.com.au
Website: www.angusfire.com.au

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Tel: (00 65) 6424 7979
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21/F Tower 2, 88 Container Port Road, Hong Kong
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Steven Tan: steven.tan_s_c@kidde-asia.com.sg

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Auburn NSW 2144
Australia
Tel: +61 2 9737 0933
Email: sales@qess.com.au
Website: www.nittan.com.au

Dealer/Distributor

NOTIFIER/INERTIA FIRE SYSTEMS

AUSTRALIA

NOTIFIER/INERTIA FIRE SYSTEMS

Sydney, Australia
Tel: 61-2-9899-4155
Fax: 61-2-9899-4156

Additional Locations: Brisbane, Queensland
Melbourne, Victoria
Representative Office

CHINA

NOTIFIER CHINA

Shanghai, China
Tel: 86-21-5027-2119
Fax: 86-21-5027-3119
Representative Office

HONG KONG

NOTIFIER HONG KONG

Kowloon, Hong Kong
Tel: 852-2730-9090
Fax: 852-2736-6590
Representative Office

INDIA

NOTIFIER INDIA

Mumbai, India
Tel: 852-2730-9090
Fax: 852-2736-6590
Dealer/Distributor

Additional Locations in India: New Delhi, Chennai,
Bangalore, Calcutta, Gurgaon

SINGAPORE

NOTIFIER SINGAPORE

Tel: 65-6271-5503
Fax: 65-6271-9961
Dealer/Distributor

TAIWAN

NOTIFIER TAIWAN

Taipei, Taiwan
Tel: 886-2-2245-7248
Fax: 886-2-2245-0927
Representative Office

PPS LTD.

AUSTRALIA

PETER MURPHY

OPEC Systems Pty Ltd
3/4 Aquatic Drive, Frenchs Forest
New South Wales 2086
Australia
Tel: +61 2 9453 9077
Fax: +61 2 9975 7808
Website: www.opecsystems.com.au
Dealer/Distributor

HONG KONG

ANDY CHAN

Safetech Limited
Block C Unit 11-12
17/F, Wah Lok Industrial Centre
Shan Mei Street, FO Tan
Shatin N.T., Hong Kong
Tel: +852 2687 4038
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Cornes Dodwell & Company Limited
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16-3, Higashi 3-chome
Shibuya-ku, Tokyo 150-845, Japan
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Website: www.cornes.co.jp
Dealer/Distributor

KOREA (SOUTH)

KOAN NAMKUNG

Godo Engineering Ltd, 3F, 219-2,
Buam-dong, Jongro-gu
Seoul, 110-817, Korea
Tel: 822-396-1522
Fax: 822-396-1524
Website: www.godoeng.com
Dealer/Distributor

MALAYSIA

MAZLAN OMAR

TMR Alam Sdn Bhd
G-9 Impian Kota
Jalan Kampung Attap
50460 Kuala Lumpur
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Tel: +60 3227 35200
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RICHARD LUKOMSKI

Wholesale, 6 Main Street,
PO Box 40
Foxton 5555, New Zealand
Tel: +64 6363 7311
Email: richard.lukomski@ppsgb.com
Website: www.acourt.co.nz
Dealer/Distributor

OPEC SYSTEMS PTY LTD

3 – 4 Aquatic Drive,
Frenchs Forest,
New South Wales 2086, Australia
Contact: Peter Murphy
Tel: +612 9453 9077
Fax: +612 9975 7808
Website: www.opecsystems.com.au
Dealer/Distributor

SINGAPORE

JOSEPH CHOO

W H Brennan & Co Pte Ltd
47 Loyang Way,
Singapore 508739
Tel: +654 9511
Fax: +6545246
Website: www.whbrennan.com
Dealer/Distributor

FORCE 21 EQUIPMENT PTE LIMITED

61 Kaki Buki Ave 1,
Shun Li Ind Park
02-24 S (417943), Singapore
Contact: Mr Daniel Cheah
Tel: 0065 6848 4424
Fax: 0065 6848 4434
Dealer/Distributor

TAIWAN

NELVEN CO LIMITED

14F-6 No 76 Sec 1,
Fu-Shing S Road, Taipei, Taiwan
Tel: +886 22721 9770
Fax: +886 28773 2047
Website: www.nelven.com.tw
Dealer/Distributor

RUSSWURM VENTILATOREN GMBH

AUSTRALIA

COMSOLINT

1402-2214 Gold Coast HWY
AU-4218 Mermaid Beach
Queensland
Tel: 0061 4394 93332
Fax: 0061 7300 90527
Email: info@comsolint.net
Dealer/Distributor

CHINA

WUHAN GDW-BROCOO

Pneumatic Technique Co. Ltd.
No 1001 B Building, Triumphal Arc
CN-430070 Plaza Xudong Road
Wuhan, China
Tel: +86 27 86835595
Fax: +86 27 86728946
Email: brocoo58@yahoo.com.cn
Dealer/Distributor

INDIA

GAS ENGG. P LTD.

C408, Shiv Sagar, Plot No 79
Gorai II, Borivali West
IND-400 091 Mumbai, India
Tel: 0091 9820035452
Email: gec@vsnl.net
Dealer/Distributor

INDONESIA

NARAYANI AGENCIES

J. B. Business Centre, Room No. 18,
Fifth Floor 506, 116 Park Lane S.D. Road
IN-500003 SECUNDERABAD
Indonesia
Email: sunita_na2001@yahoo.com
Dealer/Distributor

SECURITON AG

AUSTRALIA

AUSTRALIAN FIRE ENTERPRISES (AFE)

P.O Box 7027, Mannering Park,
NSW 2259, Australia
Contact: Mr Mike Donegan
Tel: 61 2 43 592 244
Fax: 61 2 43 593 301
Email: aifrs@ozemail.com.au
Dealer/Distributor

CHINA

SECURITON AG, ALARM AND SECURITY SYSTEMS

Alpenstrasse 20, CH-3052 Zollikofen/Berne
Tel: +41 31 910 13 21
Fax: +41 31 910 16 16
Email: claudia.flueckiger@securiton.ch
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Representative Office

SHENZHEN YAOHUAJI CHINA CO LTD

RM.F, 20th Floor Yong – Hui Building, Guo-Qi
Building, Shenzhen
Contact: Mr Raymond Ng
Tel: +86 755 8212 9863
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Email: ywk@ywk.com.hk
Website: www.ywk.com.hk
Dealer/Distributor

HONG KONG

YIU WAH (KOGARAH) CO LTD

Room 901, 9th Floor, No 113 Argyle Street,
Mongkok, Kowloon, Hong Kong
Contact: Mr Raymond Ng
Tel: +852 2781 1384
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Email: ywk@ywk.com.hk
Website: www.ywk.com.hk
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INDIA

VIMAL FIRE CONTROLS PVT LTD

19/20 Vardhaman Service Industrial Estate,
L.B.S. Marg, IN-400083 Vikhroli (West)
Mumbai, India
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Tel: +91 22 2578 3335
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KOREA (SOUTH)**ROYAL INFORMATION TECHNOLOGY CORPORATION**

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MALAYSIA**FITTERS HOLDING BHD**

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MY-47000 Sg. Buloh Selangor, Malaysia
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Website: www.fittersgroup.com
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Contact: Mr David Liu
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GICTEC INTERNATIONAL COMPUTING CO LTD

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Tel: +886 7 715 4285
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Website: www.gictec.com.tw
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UNIVERSAL PATH DEVELOPMENT CORPORATION (UPDC)

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Website: www.updc.com.tw
Contact: Mr Terry Chung
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TASK FORCE TIPS, INC.**AUSTRALIA****GAAM EMERGENCY PRODUCTS**

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Website: www.gaam.com.au
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CHINA**SHANGHAI JINDE INDUSTRY DEVELOPMENT CO LTD**

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HONG KONG**ROTTER INTERNATIONAL LIMITED**

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UNIVERSAL CARS LIMITED

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Fax: +852 2413 6063
Email: andrewplh@simerdarby.com.hk
Website: www.mitsubishi-motors.com.hk
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Mumbai Resi./Office:

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Email: info@tca.co.in
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Website: www.yone-co.co.jp
Dealer/Distributor

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433-11 Non Hon-Dong
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Dealer/Distributor

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TYCO FIRE & SECURITY**INDONESIA****TYCO FIRE & SECURITY**

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VETROTECH

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Website: www.vetrotech.com
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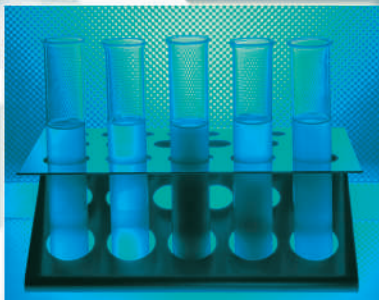
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ADVERTISERS' INDEX

Albert Ziegler GmbH & Co. KG.	49
Amkus, Inc	38
Angus Fire – A Kidde Company	56
Ansul, Inc.	OBC
Bacou-Dalloz Protective Apparel	30
Bauer Compressors Asia Pte Ltd.	37
Bio-Ex	59
Bristol Uniforms Ltd.	33
Chemetron Fire Systems	IBC
Control Logic s.r.l.	40
Cranford Controls Ltd.	27
Dafo Fomtec	59
Draeger Safety Asia Pte Ltd.	17
Dr. Sthamer Hamburg	65
Du Pont Fluoroproducts	07
E2V Technologies	62
Elkhart Brass Mfg Co Inc	18
Fire & Safety Expo Korea 2007	13
Fire Fighting Enterprises	26
Firetrace International	04
GB Solo	67
Helmet Integrated Systems Ltd.	32
Holmatro Rescue Equipment	39
Honeywell Fire Systems	28
Iveco Magirus Brandschutztechnik GmbH	46
Lancier Hydraulik Co. KG	36
NFPA	45
Nittan UK Ltd.	24
Plastika Akrapovic	35
PPS Ltd.	52
Russwurm Ventilatoren GmbH	52
Securiton AG	64
Solberg Scandinavian	59
Super Vacuum Manufacturing Co., Inc.	52
Task Force Tips, Inc.	IFC
Texas A & M Emergency Services Training Institute	21
Tyco Safety Products – Hygood	43
Tyco Safety Products – Skum	61
Unifire AB	21
Vetrotech Saint Gobain International AG	09
Wolf Safety Lamp Company	29



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**June 2007
Issue 22**



Front Cover Picture: The Rescue and Fire Fighting Department at Bangkok's new Suvarnabhumi Airport has launched its new Dräger Safety fire training facility. Complete with three separate training capabilities their safety and security preparedness is set to reach new heights. Picture Courtesy of Dräger Safety ©

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Contents



21-24



39-41



43-45



47-50

05 NFPA Foreword

07-18 News and Product Profiles

21-24 Thailand's Aviation Training Takes Off...

27-28 Do Type Approval Certificates Give The Entire Answer?

31-36 Helmets, Boots & Gloves

39-41 Eradicating the Myths about Water Based Intumescent

43-45 HFC Clean Agent Fire Protection in Health Care Facilities

47-50 Evolution of Fire Alarm Technology: Interactive Firefighter's Display

52-55 Aerial Ladder Vehicle Roundup

57-59 Quick Fire Knockdown in the Modern Fire Environment: Overpowering BTU's with Big Flows

61-63 Virtual Training: The Realistic Option for Training of Countries

65-67 Large Diameter Hose Solutions for Emergency Water Management

68-69 New Thinking and Current Developments in Emergency Command and Control

71-74 Air Monitoring as Part of Preparedness

77-79 Fire Performance Cables - Assessing The Standards Internationally

80-87 Distributor & Representative Office Listing

88 Advertisers' Index



57-59



61-63



68-69



77-79



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Foreword

Pace of progress

The world's pace of progress is invigorating and we are better off because progress forces change and the positive results of change outweigh the harmful ones. Needless to say, the world's fire protection pace is at a gallop. Lives and property are saved every day as a result of progress in all fields of fire safety, and no one argues for the pace to slow down.

By Olga Caledonia

Executive Director
International
Operations, NFPA

Scientifically based consensus codes and standards are at the heart of the NFPA mission. As our understanding of fire has grown, so has our ability to design fire protection strategies to mitigate its unwanted effects. The Fire Protection Research Foundation, an affiliate of NFPA, has been engaged in major research programs, both domestic and international in scope, designed to provide the type of information that can better support the NFPA codes and standards process.

This past April the Foundation conducted a workshop in Beijing under the US-China Standards and Conformity Assessment Cooperation Program funded by the US Trade and Development Agency (USTDA) to exchange information on new technologies and standards for fire detection systems. The Foundation has several major research initiatives to enhance fire safety standards for detection in support of NFPA 72, the *National Fire Alarm Code*. The *Emerging Technology and Standards Development for Fire Detection Systems*

workshop was a valuable opportunity to gain a better understanding of current practices surrounding fire detection systems in the U.S. and China with an eye towards the future. One of the main objectives of the gathering was to foster international collaboration. Manufacturers and designers of fire detection and signaling systems attended the event, as well as government officials responsible for standards development.

NFPA international outreach programs support the Association's mission particularly the advocacy of consensus codes and standards, research and education. The Foundation continues to respond to challenges with activities in a number of areas including benchmarking state of the art developments in suppression and detection systems, research planning in the fields of post-fire analysis and transportation vehicle safety, electrical safety and others. We invite you to visit www.nfpa.org/research to learn more about the Foundation and major research programs undertaken by the Foundation since its inception.

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Gigantic Airbus 380 Hangar protected by Cafco

In order to prepare in advance for the delivery of the massive new Airbus 380 aircraft, Malaysian Airlines is extending its maintenance facilities at Kuala Lumpur's Sepang International Airport by constructing an enormous new hangar, incorporating the world's longest column-free steel span of 230 metres.

The incredible size of the new aircraft has demanded a quite unique column-free design in order to accommodate the A-380's wing span during maintenance work. When fully in place the two colossal supporting steel towers (and 44 individual columns) will bear 5,700 tonnes of steel roofing made up of truss sections. These are to be fabricated on the ground before being lifted into position with giant hydraulic jacks, in one large section.

The roof trusses will not receive passive fire protection but the two giant steel towers (and 44 individual columns) are being given two hours fire protection through the application of SprayFilm WB3, an advanced water based intumescent coating manufactured by UK based CAFCO INTERNATIONAL. In total, more than 4,000 square metres of steel are being protected.

The intumescent passive fire protection system consists of a two-pack Epoxy primer and Micaceous Iron Oxide Intermediate (MIO) coating for corrosion protection. This treatment is over-coated with SprayFilm WB3 to the required dry film thickness and then sealed with a two-pack Polyurethane coating to provide a long-life, maintenance free finish.

Sprayfilm WB3 has been used for a number of years on many major national and international projects. The thin film intumescent coating offers a fast 'through drying' solution and has proved to be a cost-effective alternative to solvent based equivalents. When subject to fire, a chemical reaction takes place causing the coating to expand and form an insulating layer, which prevents the temperature of the steel rising to a critical level.

Sprayfilm WB3 has been fully tested to BS476: Part 21 and ASTM E119 from Underwriters Laboratories (UL) and assessed in line with the Association for Specialist Fire Protection (ASFP) publication 'Fire protection for structural steel in buildings'. It also has Loss Prevention Certification Board (LPCB) Certification giving clients a quick, safe and easy-to-use treatment for providing between 30 and 120 minutes fire resistance on structural steel, including I-section beams, H-section columns and hollow sections. At ratings such as 120 minutes, the required final thickness of an intumescent coating increases, but Sprayfilm



WB3 has the lowest thickness requirements of any water based intumescent coating and its high build capability reduces the number of coats required, thus facilitating lower labour costs.

The construction of the hangar at Kuala Lumpur is a joint venture between Zelan Construction, Marubeni and Tokyu. Installation of the SprayFilm WB3 is being

carried out by Cafco's recognised applicator, Rushoe Enterprises. The site application work began in December 2006 and is expected to be complete by mid 2007.

For more information, please contact:
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Email: info@cafcointl.com
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BW Technologies by Honeywell introduces the revolutionary GasAlertMicroClip

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The GasAlertMicroClip which is ATEX approved, offers full-function multi-gas instrument performance, with the simplicity, compact size and ease-of-use of a disposable gas detector. The small size, long life and high specificity of the sensors are central to the sleek, compact and functional design.

Simultaneously displaying oxygen, hydrogen sulfide, carbon monoxide and percent LEL combustibles present, the GasAlertMicroClip is ideally suited to a wide range of applications and customers including confined space entry, telecommunication vaults and manholes, refinery and petrochemical plants, construction contractors, and fire service and fire-ground overhaul monitoring applications.

The GasAlertMicroClip is housed in a rugged, fully immersible, water resistant housing with built-in concussion-proof boot. Other features include an extra-loud audible alarm, flashing LED light bars and built-in vibrating alarm. Field-selectable user options allow the



GasAlertMicroClip to be customized for virtually any monitoring application.

The instrument is powered by means of an internally housed lithium polymer battery that provides up to 14-hours on continuous operation on a single charge. At just 160 grams (5.6 oz.), GasAlertMicroClip is truly more for less.

Simply put, the GasAlertMicroClip is the world's best value in confined space gas detectors.

For more information about GasAlertMicroClip, visit www.gasmonitors.com

RESQTEC MaxGrip Extrication Glove

RESQTEC announces that they will launch their own glove for rescue operations; The MaxGrip Extrication Glove. They incorporate a lot of features to help in operations by giving maximum protection, grip and durability. Developed using the know-how of RESQTEC, combined with the use of high grade materials and fabrics.

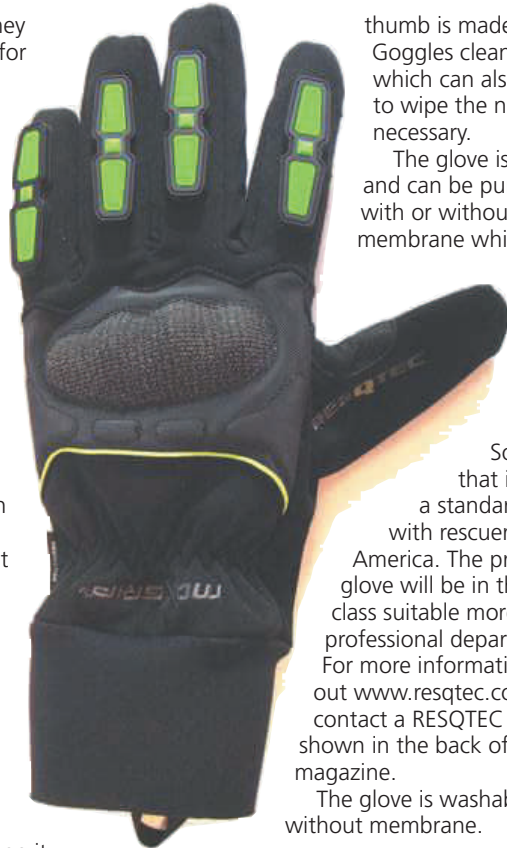
With the introduction of the MaxGrip RESQTEC is the first rescue tool manufacturer to develop their own glove. The reason for RESQTEC seems simple, as they decided to develop it through their experience that the gloves offered in the market, do not fit all the specific needs rescue have. Although a rescue glove is already very known in North America as an important tool for a rescuer, there are still many areas for improvement. A glove is an important tool when it comes to rescue in terms of safety, protection and control but also durability and fire and cut resistance. Because of those reasons it seemed a logical step for us to develop our own.

The MaxGrip Glove is the ultimate glove for rescue operations! It is constructed through 3 layers of Kevlar protection combined with the high quality materials, and unique features. If you want the best rescue glove on the market there is only one: RESQTEC MaxGrip.

The MaxGrip is constructed through 3 layers of Kevlar for ultimate protection and durability. Starting with a Kevlar Twaron lining, where in the Palm there is a special silicon Kevlar which gives a very high durability and grip. To give that extra protection and durability there are anatomical Kevlar palm reinforcements. The top of the glove is made out of cut resistant 2 way stretch material.

To give freedom of movement and protection for the knuckles the glove is made with a hard 3D Kevlar knuckle protection.

Another nice feature is the neoprene wrist warmer and debris protection which makes it very easy to put on the glove but also to keep glass out of the glove. It makes for a very comfortable fit. The



thumb is made out of a Goggles cleaning fabric which can also be used to wipe the nose if necessary.

The glove is washable and can be purchased with or without membrane which can

block out harmful fields like blood or hepatitis B among others.

Something that is becoming a standard choice with rescuers in North America. The price of the glove will be in the higher class suitable more for the professional departments. For more information check out www.resqtec.com or contact a RESQTEC dealer shown in the back of the magazine.

The glove is washable with or without membrane.

Features:

- Finger rubber protection
- Cut resistant 2 way stretch fabric.
- 3D Kevlar knuckle protection
- Neoprene wrist warmer and debris protection
- Goggles cleaning fabric on thumb area
- Reinforcement of the thumb area
- Silicon Kevlar palm hand for perfect grip and protection double layer Kevlar which is cut resistance.
- Anatomical Kevlar palm reinforcement
- Gel padding protecting your hands against crashes and hits
- High cut resistant
- Washable

Materials:

- Top: Kevlar, Rubber protectors
- Palm: Nomex® with silicon, Kevlar, Gel Padding, Clarino®
- Lining: Twaron®

For every type or rescue operation, the RESQTEC MaxGrip Extrication Glove can be used. Because of all the great features this glove has, your hands are protected against everything that can happen on a rescue scene.

For more information, please contact:

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Kidde Fire Protection Gets Sirius

KIDDE FIRE PROTECTION announced today that it will be launching its new Sirius II range of conventional fire alarm control panels at International Fire Expo 2007 on Stand K31. Kidde Fire Protection, a world wide leader in the development of fire detection and suppression systems, is part of UTC Fire & Security, a unit of United Technologies Corp.

The Sirius II fire panel combines performance, aesthetics and superb value for money. Available in 2, 4 and 8 zone configurations it is approved to EN54 Parts 2 and 4. Features such as code access, one person walk test and real time clock make it the natural choice where ease of use and flexibility are required.



Sirius II is suitable for small to medium-sized applications such as hotels, offices and leisure centres. Compatible with a wide range of detection devices including Apollo, Nittan and Hochiki, it is ideal for new installations and refurbishments. It is a reliable and affordable fire control panel that will assist customers in meeting the requirements of the new Regulatory Reform (Fire Safety) Order.

Sirius II complements Kidde Fire Protection's existing range of fire protection systems including Vega analogue addressable control panels, HART™ High Sensitivity Smoke Detection (HSSD™) and Alarmline™ Linear Heat Detection systems.

For more information, please contact:

Angus Fire
Tel: +44 (0) 1844 265021
Email: jon.brittain@kiddeuk.co.uk

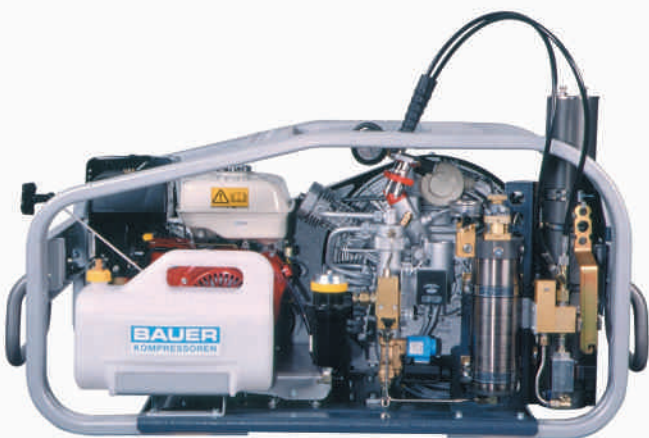
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Tel: +1 860-284-3094
Email: Kimberly.reidy@fs.utc.com

BAUER COMPRESSORS



Verticus 5 /KAP 5 stationary compressor

The most advance modular unit system used in fire stations with SPC-compressor control B-CONTROL, P Filter System and integrated filling panel. The unit can be upgraded to a silenced unit VERTICUS 5 type and additional filter housings, refrigeration dryer AIR-KOOL, external filling panels as well as storage cylinders can be easily fitted.



Mariner 250/320

The power pack for larger delivery of air, 250l/m and 320l/min. A newly developed, super-light aluminium chassis guarantees the best protection against corrosion! Inter- and after coolers made of stainless steel resist the toughest climatic conditions. The construction of the motor rocker stand reduces vibration for smooth operation as well as self-tensioning of the v-belt drive.

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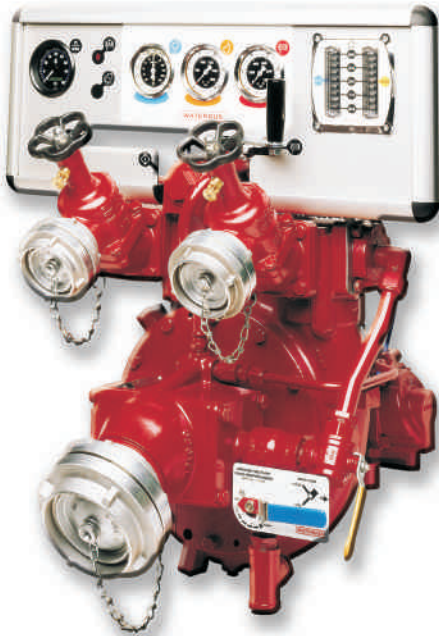
SAGE TECHNOLOGIES, LTD.

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Waterous Unveils New Bronze HiLo Pump For Asia/Pacific Region



WATEROUS COMPANY, a global leader in fire suppression technology, announced the release of their new bronze HL200 and HL300 (HiLo) Rear-Mounted Fire Pumps for Australia and the Asia/Pacific region. Designed for use in all rear-mounted applications, the new bronze HiLo pumps

feature durable construction for longer service life and built-in high-pressure relief valves for enhanced attacking power.

"The new bronze construction adds heavy-duty strength to a pumps that an already efficient water delivery systems," says Barry Coe, Sales Representative for Waterous-Australia. "For rear-mounted pump performance there isn't a better pump series on the market."

Manufactured to the latest CEN-recommended standards, the bronze HL200 is capable of 2000 l/m at 10-bar and 400 l/m at 40-bar and the HL300 is capable of 3000 l/m at 10-bar to 400 l/min at 40-bar. It features a durable bronze construction and the two-stage HL200 features automatic piston priming with a rated performance of 1000 l/m from 7.5-meters lift.

The new bronze HiLo comes with a standard six-port manifold for flexible discharge valve positioning, left-or right-hand 100 mm tank-to-pump connection and an easy mounting for a 'Round-the-Pump' foam system. Both HiLo models are backed by an industry-exclusive five-year warranty.

For more information, please contact:
Waterous – Australia
Tel: 07 55228930
Email: bcoe@waterousco.com.au

Vision Fire & Security has a new identity – Xtralis

We are pleased to announce that Vision Fire & Security (VFS) has changed its name to XTRALIS with effect from 15 May 2007.

Our business is growing. This growth is enabling us to extend our portfolio through ongoing product development as well as acquisition of complementary technologies.

The change in our business deserves to be recognised with a new name. Xtralis represents the move from Vision Systems to our own entity. With offices established globally, our reputable products and services, we are set for continued business growth globally providing solutions for life safety, business continuity and security.

The day to day running of the company, its staff and operations continue as before. The new name will allow Xtralis to continue to build a prominent global brand identity. Xtralis' product range encompasses air-sampling smoke

detection systems (VESDA), sophisticated video-based security solutions (ADPRO), voice alarm systems (MILLBANK), fire control & management solutions (PROACTIV) and a latest acquisition of ASIM, a manufacturer of security detectors, traffic detection & traffic data acquisition systems.

As a result, you will see a new logo and our web address has changed to www.xtralis.com. All current offices remain with the addition of Switzerland as Head Office for continental Europe.

For more information, please contact:
Xtralis
Website: www.xtralis.com



Notifier's ONYX FIRSTVISION™ Revolutionizes Emergency Scene Size-Up

Breakthrough Technology Helps Firefighters Quickly Identify Fire Origin and Migration, Building Hazards and Exit Routes

NOTIFIER, a world leading manufacturer of commercial fire alarm technology and systems announces ONYX FIRSTVISION™, a revolutionary *wayfinding* navigational tool for firefighters and other emergency responders. Only ONYX FIRSTVISION, a PC-based touch screen, graphically displays critical information on the origin and spread of a fire; allowing firefighters to quickly locate and extinguish the fire, reducing property loss and saving lives. With ONYX FIRSTVISION, Incident Commanders can focus on critical information necessary for making fast, effective and well-informed decisions, speeding scene size-up and execution of response operations.

Developed from extensive research and interviews with senior level professional firefighters, ONYX FIRSTVISION is easy to use, requiring no special training. The interactive display summarizes building floor plans showing the location of all active fire alarm devices, water supplies, evacuation routes, access routes, fire barriers, gas, power and HVAC shutoffs, as well as chemical and structural hazards in the building. With ONYX FIRSTVISION connected to the fire alarm control panels, crucial information is easy to interpret with a spatial, graphical depiction of the location and sequence of detector activation. And unlike traditional graphic annunciators, ONYX FIRSTVISION is interactive, allowing emergency responders to access information they need to conduct safe and efficient emergency response operations.

ONYX FIRSTVISION – another breakthrough technology from NOTIFIER. Leaders in Life. Safety. Technology.

For more information on ONYXFirstVision, please visit www.notifier.com

Unleash the 'Fire Dragon'

When developing or enhancing 'fire and rescue' training there are a broad spectrum of operational and financial implications to consider. In simple terms all training should be appropriate, realistic and safe whilst limiting its impact on the environment and satisfying any budget limitations.

In answer to these evolving needs, and in recognising the increased skill diversity required by modern day emergency crews, Dräger Safety has adapted its legendary SCBA gallery and fire training technology to produce a mobile capability – the Fire Dragon.

Versatility

The Fire Dragon is a mobile training platform offering a wide range of options, depending upon the user's requirements. It is important to understand that these are an engineered solution, not an 'off the shelf' product. The unit's configuration can be adapted to provide the following capabilities:

- SCBA exercise evaluation and training inc.
- Defensive and offensive fire fighting training inc. flashover
- Workplace Safety Training (i.e. confined space entry, height safety, gas detection)
- Major incident/command and control training
- Personal protection and detection equipment servicing
- Community fire awareness/Public relations
- Hand-held fire extinguisher training

The Fire Dragon is normally based on the standard external dimensions of ISO shipping containers i.e. 20' or 40' for ease of shipping and/or road transport. These are however the only fixed dimensions and Dräger Safety's many previous projects have demonstrated the high levels of versatility available through their 'value engineering' processes.

As evidence of the Fire Dragon's versatility Dräger Safety will deliver Asia Pacific's first unit later this year. This unit represents the latest generation and includes many of the above listed capabilities; SCBA training maze, LPG Propane fuelled fire scenarios, an exercise evaluation section and equipment servicing area complete with a computerised control system and OH&S compliant 'cool room'.

The Fire Dragon can be operated in almost any environment and can be supplied with its own power generator, high pressure breathing air compressor and fill station. This can be a crucial consideration for users who operate in remote locations and must maintain a state of operational preparedness.

Environmental consideration

For fire fighting applications Dräger Safety incorporate their proven LPG Propane training systems within the Fire Dragon. With the Dräger Safety TUV accredited safety systems and control included as standard the user is assured of safe operation, repeatable scenarios and environmental acceptability.

As a reflection of Dräger Safety's engineering capabilities and environmental considerations a water recycling system is also available to minimize usage during live fire fighter training evolutions. This can also reduce the OH&S implications when



operating in sub-zero temperatures and may broaden the scope of possible training locations available.

Wide audience

The range of existing users of Dräger Safety's Fire Dragon is extensive and includes professional fire services, military departments and industrial units alike. The versatility of the configuration and LPG Propane fire scenarios means it can reflect many different training environments. Offering both recruit and skills maintenance capabilities the applications include, but are not limited to, the following:

- Residential
- Commercial
- Aviation
- Marine
- Industrial

Whether it is a kitchen scenario in a residential home, a galley fire in an aircraft, an engine room fire in a ship or a paint storage rack in a factory – the Fire Dragon can re-produce a representative training environment. Additional features such as staircases (with or without collapsed treads), raking ladders, dry risers, power distribution boards and varying door and window styles add further realism. This really is an engineered solution. . .

Each Fire Dragon can be equipped with necessary personal equipment such as SCBA (open and/or closed circuit), personal gas detection, thermal imaging cameras and communication equipment. If a nomadic instructor protocol exists then their apparel can also be stowed within the unit to minimize today's travel baggage constraints.

Engineered solution

The Fire Dragon is yet another example of Dräger Safety's commitment to the international fire and rescue communities. Whilst an already proven and established solution across the US and Europe, the Fire Dragon is now becoming the natural choice for many emergency and military organisations within Asia Pacific also. As with all Dräger Safety products, their in-house training and service capabilities enable them to fully support each system.

APF

For more information on the Fire Dragon or to discuss your training needs please contact Dräger Safety on the details below.

Mat Lock
Dräger Safety Asia Pte Ltd
 Singapore
 Email: mat.lock@draeger.com

If foam choice is important, technique of application is crucial

It is commonly admitted that the foam concentrate is a critical parameter to achieve extinction. Eventually, AFFF would be considered as the best option.

Scientists raised concern over the poor behavior of fluorinated compounds in the environment. Numerous studies indicate that these compounds are very Persistent (vP), Bioaccumulative (B) and/or Toxic (T).

So how are we handling the situation if the most efficient foam cannot be used for environmental concern?

Let us examine the question.

Fires can fall in three categories; solid fuel fires (class A), hydrocarbon fires (oil) and polar solvents fires (chemicals) class B.

It has been proven that class A foam outperforms AFFF on solids fires. Fire Brigades are tackling class A fires for at least 95% of their total. So AFFF can be replaced easily with a non-fluorinated foam in that case.

French Safety Committee for Oil Industry has conducted a study to ascertain various scenarios on oil fires. As a conclusion, they pointed out that,



whatever the foam is, it is highly recommended to select gentle application, such as fixed foam chambers. This indicates that forceful application with monitors and AFFF should be only

considered as an exception and not a rule.

It is commonly accepted that, on chemical plants, gentle application is the only option, due to the fact that forceful application would not achieve extinction with a reasonable amount of foam. As a fact, all the relevant standards (EN1568 and UL) classify foams under gentle application.

If not for direct application (monitors) in oil industry, it is then widely accepted that it would be better – or mandatory – to rely on fixed systems delivering foam in gentle manner to achieve extinction and protection of the risks. It increases dramatically the efficiency of the fire attack, reduce the consumption of water and eliminate the need for AFFF.

Nowadays, fluorine free foams are available and meet international standards, such as EN1568, LastFire and GESIP.

It is noteworthy that, by following the best application methods, it is possible to switch from fluorinated foam such as AFFF and FFFP to an eco-friendly fluorine free technology and address both the issues of extinction and environmental with confidence.

For more information, please contact:
Bio-Ex S.A.

Email: export@bio-ex.fr

Website: www.bio-ex.com

Reach out in confidence with FireMaster Ultra

Building on the unique blend of expertise, experience and market knowledge from Southcombe Brothers Ltd, the FireMaster Ultra® structural fire gloves lead the way in design and technology.

The only gloves in the world using PYROHIDE fire-resistant leather, FireMaster Ultra® gloves are made with premium, high-end materials at every stage. Fully NFPA and EN659 certified, designed for supreme heat and cut resistance but still dextrous and lightweight, US fire houses have been clamouring for test samples.

The finger-curved design has been imitated but never bettered. The refined design gives confidence that only comes from excellent fitting, lightweight, leather kit.

"There's a reason why we supply almost 80% of fire brigades in the UK," said David Southcombe, Managing Director of Southcombe Brothers Ltd. "And that is because our gloves consistently outperform all others. With 160 years in business behind us we have made it our mission simply to make the best performing fire gloves on the market. We have no interest in cutting corners or imitating inferior designs."

Made from Pyrohide® fire-resistant grain leather, unique to Southcombe Brothers, the gloves will not crack or warp



under extreme heat conditions. And this amazing leather is not just fire-resistant, it will repel chemicals, liquids and heat – then dries soft and supple.

The gloves also use a Gore Crosstech™ membrane, Kevlar™ palm and finger patches, Kevlar™ blended linings, Kevlar™/Nomex™ cuffing (on wristlet models only) and are stitched throughout with Nomex™ thread.

For more information, please contact:

Southcombe Brothers Ltd

Email: cjs@southcombe.com

Website: www.southcombe.co.uk



Task Force Tips' BLITZFIRE® portable monitor:

providing maximum coverage with limited staff

Task Force Tips designs equipment with the understanding that firefighting tools must work hard under extreme conditions – at times even acting as an additional team member. That logic helped TFT to develop the BLITZFIRE® portable monitor — an industry standard known worldwide for safely providing maximum coverage with limited staff.

The BLITZFIRE® has six detent flow positions and a patented integrated turbulence-free slide valve that allows an operator to either gate a stream in manned usage, or to use the monitor as an unmanned device. Even with its flow of 500 gpm (2000 lpm), the BLITZFIRE® enjoys the portability of a handline, yet offers carbide tipped stability, sporting the widest deployed stance (34" or 86.3 cm) of any monitor in its class. Its ability to preconnect to an apparatus' tailboard makes it the monitor of choice for initial attack teams.

The best selling portable monitor allows "first due" firefighting crews to focus a blitz attack flow directly to the seat of the fire just moments after arrival. Its low (10° above ground) attack angle gives operators the ability to "go in the front door" safely with high fire flow, and its 20° side-to-side (40° total) and up to 50° elevation give it maximum maneuverability. If the unit destabilizes, its patented safety shut-off valve closes automatically – slowing the BLITZFIRE® flow to near stroke end, eliminating possible water hammer.

The BLITZFIRE® can be ordered with TFT's exclusive oscillation feature that offers a 20-, 30-, or 40- sweeping motion. This unique feature, which can be retro-fit to many existing models, is being used by emergency specialists for bio/chem incident preparation. Emergency containment corridors go up in moments, allowing large groups of victims to be bathed in oscillating BLITZFIRE® streams, with little impact of the low pressure stream felt by the victim(s).

"For those who have limited storage space who still want the power of the BLITZFIRE®, our engineers



have developed the Blitz Lite™," said Larry King, TFT VP of International Sales. "It's actually a 'Micro-monitor' – which tells you how easy this is to set up and handle. With the Blitz Lite's smooth waterway and built-in stream straightener, there's minor friction loss – something like 8 psi at 500 gpm. So it's streamlined in design, and still a powerhouse."

Although 500 gpm (2000 lpm) is ideal for resolving many problems, at times firefighters are faced with battles on smaller scales – where they're looking at 1" or 1.5" lines. In those cases, QuadraFog selectable nozzles are an excellent nozzle choice. The optional colored pistol grip helps to identify this economical lightweight selectable gallonage nozzle, which comes in tip-only configuration for break-and-extend operations, or with stainless ball shutoff.

The QuadraFog 1" (25mm) series features unique cut fixed metal fog teeth that produce patterns ranging from straight stream to narrow fog to extremely wide fog. The 1" offers 5-10-24 or 40 gpm @ 100 psi or 20-40-100-150 l/min @ 7 bar versions. Adding either the low-expansion or multi-expansion foam attachments broadens this selectable gallonage nozzle's versatility.

The QuadraFog 1.5" (38mm) comes with choice of fixed or stainless steel spinning teeth, and features 30-60-95-125 gpm @ 100 psi (110-230-360-470 l/min @ 7 bar), or low pressure 75 psi (5 bar). This 1.5" (38 mm) nozzle boasts both FM approval and NFPA 1964 compliance. The 1.5" (38mm) QuadraFog offers a choice of fixed or stainless steel spinning teeth, and also accepts low-expansion or multi-expansion foam attachments.

APF


For further information:
Tel: +1 219 548 4000
Email: intsales@tft.com,
or visit www.tft.com

The future of fire detection has begun

– with the new generation of fire detectors from Securiton AG

The new SecuriStar® line of fire detectors from Securiton is taking the fear out of fire. These clever detectors are able to detect fires in their earliest stages with a reliability and precision never equalled before – for maximum safety, whatever the environment.

With a whole new range of technical innovations the SecuriStar® fire detectors are now more intelligent than ever. What's more, the amount of installation and operating work involved has been drastically reduced. For instance each individual fire detector has its own individual UNI, or Unique Number Identification. The benefits during installation and operation are immeasurable. The detector is connected to the system very simply using plug and play, which means that any cabling errors are instantly localised. If a detector is replaced, its successor automatically takes over its UNI.

This versatile range of products means that Securiton is able to ensure that every environment is monitored by precisely the right type of detector.

The Securistar H is the first fire detector which, once installed, no longer requires configuration with a complex set of parameters; instead it adapts permanently and entirely autonomously to its environment. With the help of the self-developed "cube levelling system" the new fire detector continuously measures ambient parameters such as absolute temperature, the relative temperature rise, and any air murkiness. It then uses these values to determine the optimum sensitivity for each operating site and adapts to the prevailing circumstances.

Deception alarms on the defensive

Maximum fire detection accuracy is the result of improved smoke and temperature symmetry, inter-connected sensors, optimised smoke penetration response and new alarm filters. With the operating mechanism now consistently optimised in this way, the reliability of detectors with regard to deception alarms has improved dramatically. The enhanced



self-monitoring capability also plays a major part: The detector provides even more detailed status messages so that the surveillance personnel at the control centre are instantly in the picture.

Compatible in any direction

The devices of the new SecuriStar® line of fire detectors are both forward and reverse compatible. This means that existing detectors can easily be replaced by the new generation of detectors. The existing detector bases, data format and line network can all be combined with the new devices without compromising performance. What's more, today's SecuriStar® fire detectors are designed to match up perfectly with tomorrow's new types of control centres and signalling lines.

On the alert, whatever the situation

With its three detector types the new SecuriStar® line is an absolute all-rounder. Under its elegant exterior the MTD 533 combines a smoke detector and a heat sensor. While the UTD 533 is a steadfast heat detector, the MSD 533 uses scattered light to detect instantly any open fires generating smoke. This versatile range of products means that Securiton is able to ensure that every environment is monitored by precisely the right type of detector.

APF

For more information please contact:

Securiton AG

Alarm and Security Systems

Alpenstrasse 20, CH-3052
Zollikofen/Berne

Tel: +41 31 910 11 22

Fax: +41 31 910 16 16

Email: info@securiton.ch

Website: www.securiton.ch

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www.arcticfoam.com

New Foam Product Will Revolutionise Decontamination Theory And Practice In Europe

A foam product that will revolutionise decontamination theory and practice in Europe is being introduced from the US by PROFESSIONAL PROTECTION SYSTEMS. Designated EasyDECON™ DF 2000 this new decontamination solution is capable of killing or neutralising a broad range of WMD contaminants. Also because of its unique chemical structure it can be used on practically anything from vehicles to whole buildings. A chemical and biological decontaminant it also kills mould as well as eliminating its smell.

EasyDECON™ DF200 is particularly suitable for the decontamination of structures as it has the unique ability to adhere to vertical and inverted surfaces where it creates a foam blanket to maintain the required contact time between agent and the decontamination formulation. It has the added virtue of being non-corrosive and its use adds no environmental load to the clean-up operation. Kill time ranges from a few minutes to half and hour depending on agent and environmental conditions.

When used with application equipment designed by the US Intelagard company even coverage is achieved thus maximising contact time and suppressing any reaction from the agent being treated whilst decontamination takes place.

Whilst the Intelagard company are suppliers of EasyDECON™ and equipment for its application to the American military and Homeland Security amongst others PPS have won exclusive rights to the product in the UK, France, Spain, Germany, Japan and Italy all of whom are major users of current PPS decontamination equipment.

The obvious major feature of this new system being offered by PPS is that it does not use water. According to Mark Whitcher, Managing Director of PPS, water has been at the core of all decontamination technologies until; now. "Essentially what water does" he says "is move contaminant from one place to another. In small quantities water can be contained and disposed of. With something the size of a vehicle you start to have problems and with a building it becomes just about impossible to use successfully. EasyDECON™ is the answer".

Various systems for the delivery of the foam are available, from a backpack to a large scale fixed site decontamination system.

A relatively small scale deployment apparatus, a backpack unit named the Macaw can be used for facilities protection at nuclear power plants, pharma companies, petro-chemical facilities and similar process operations as well as military installations. It has also developed a sport side being on hand at most US Grand Prix events.

The fixed site decontamination system on the



other hand can undertake interior and exterior building decontamination, hazmat and fire response, cargo and infrastructure protection as well as decontamination at airports, runways, seaports and roads amongst other types of infrastructure.

Further information from:
Professional Protections Systems Ltd.
Tel: 01908 272240
Fax: 01980 371605
Email: sales@ppsgb.com
Website: www.ppsgb.com

HISL's Alpha fast jet helmet

What is the connection with Fire...?

Helmet Protection on land and in the air

Few of the many thousands of the Cromwell fire helmet users throughout the world, will be aware that UK based HELMET INTEGRATED SYSTEMS LTD (HISL) are also a leading international manufacturer of helmets for military and civil aircrew, now used by over 60 air arms worldwide.

The extent to which aircrew helmets have developed over the years since the introduction of the 'bone dome', mirrors the similar development of fire helmets, in that there are very similar requirements for high levels of fire and impact resistance, comfort and fit, lightweight construction, and the ability to integrate with breathing and communication systems.

HISL have been able to continuously transfer developments in materials and anthropometric research from the aircrew sector, to that of fire and rescue helmets, the latest result of this being their new



Cromwell dual shell helmet ER1-FR2, which enables different helmet configurations to be adopted depending upon operational requirements. This is a similar design concept to that of the helmet unit that they supply for the very latest F35 Joint Strike Fighter (JSF) which enables different 'mission modules' to be attached to the helmet unit.

For further details of the Helmets range fire and aircrew please visit their website www.helmets.co.uk

Holmatro® Duo Pump DPU 31 PC: light AND quiet

The DPU 31 PC Duo Pump – Personal Power® has been developed to meet the demand for a light and silent duo pump for the simultaneous operation of two rescue tools.

With a **weight of only 25 kg** and an **excellent centre of gravity** the DPU 31 PC Duo Pump can easily be carried by one person only. Most countries' occupational health and safety regulations state that one person is not allowed to carry objects heavier than 25 kg.

Another important feature is the **low noise level of 68 dB** at 1 m distance. This is more comfortable for the victim. It also provides a better workplace for the rescuer because it is easier to communicate at the rescue scene. The pump has an eco mode switch: when connected tools are not used, the engine automatically switches to eco mode for a very low noise level and fuel consumption.



The DPU 31 PC Duo Pump has **LED lighting** above the valve block which allows for easy identification of the pump location in the dark. Furthermore, it facilitates coupling and uncoupling of the hoses.

The pump is also equipped with **gauges** at the front for easy checking of oil and petrol levels.

The hydraulic oil contents of 2490 cc is sufficient to operate two rescue tools at the same time.

What makes the DPU 31 PC Duo Pump really unique is that it is the first Holmatro® duo pump that is standard equipped with Holmatro's revolutionary **CORE™ Technology**. This technology is a turning point in *speed, ease and safety* of operating hydraulic rescue tools. For the DPU 31 PC Duo Pump and other duo pumps equipped with



CORE™ Technology this means that you only need two hoses instead of four to connect two tools to the pump. Every connection of a hose to a pump and tool means 2 times coupling instead of 4, and 2 times clicking dust caps together instead of 4. With a duo pump this means **a saving of 8 times 'coupling and clicking'!**

A traditional rescue system requires the rescuer to switch the pump (valve) to neutral before changing (disconnecting and connecting) the rescue tool is possible. A CORE™ system allows the rescuer to change the tool while the hose is 'under flow'; the pump is running and the valve is always selected. It is no longer necessary to change the



tool at the pump. On the contrary, the rescuer can change his tool any time, whenever the circumstances require and without delay, even without releasing pressure at the pump. Working with CORE™ increases the rescuer's flexibility, saves time and is much easier to handle.

APF

For further information
please visit:
www.holmatro.com

holmatro®
rescue equipment

Qatar Petroleum selects Emergency Command System products for advanced fire training

Qatar Petroleum, one of the world's largest liquefied natural gas and oil exporters, has selected a package of advanced fire safety training software and services from leading UK technology company VECTORCOMMAND. The products were chosen to support the company's ambitious expansion plans for developing its gas and oil reserves and LNG tanker fleet, with associated requirements for training for crisis responders.

The two products selected – Emergency Command System/Tactical Command Trainer and Emergency Command System/Training and Exercising System – are widely used by fire safety managers throughout the world to provide tactical command training and operational command training for crisis responders.

Qatar Petroleum will initially use the two virtual reality-based training packages to prepare commanders for dealing with large tank farm fires and training for dealing with fire on LNG tanker ships. As part of the Qatar Petroleum contract, senior system developers and customer support staff from



VectorCommand will travel to Qatar where they will work closely with local Qatar Petroleum personnel on product and scenario customisation as well as staff training and familiarisation.

One of the many benefits of adopting a virtual reality-based approach within an

integrated fire command training system is that command at both the tactical and operational levels can be combined within exercises with a high degree of realism. Individual fire commanders can be trained and tested on their individual tactical fire ground skills, and more senior commanders can be trained and tested on their ability to manage major incidents where complex challenges can occur, resources need to be carefully managed and difficult decisions made.

Emergency Command System products enable all exercise activities to be recorded for post-exercise analysis and comment. Consistency of training doctrine is promoted by adopting a computer-based approach which incorporates local operational procedures and local and international best practice. Emergency Command System scenarios already incorporate advanced technology for simulating typical activities specific to oil and gas fires, such as drenching systems and foam blankets.

For further information contact:

VectorCommand Limited

Tel: +44 (0) 2392 410400

Website:

www.emergencycommandsystem.com

Sage Technologies, Ltd. Introduces Hands Free Thermal Imaging To International Markets

SAGE TECHNOLOGIES is looking for dealers to market their hands free helmet mounted thermal imaging camera, HelmetVue, in international markets.

The HelmetVue camera system weighs less than one pound and uses two commercial AA batteries. It possesses a 160 by 120 pixel camera with a 50 degree field of view. The camera can be mounted on most helmets by a bracket secured to the brim or by a helmet strap adaptation. Either method enables the camera to be secured to a quick release mechanism for transfer to another helmet.

The HelmetVue camera is distributed in the United States and Canada by the Total Fire Group company and is marketed as the FireWarrior. Hundreds of units have been sold and have demonstrated the camera's effectiveness in severe environmental conditions. The HelmetVue camera is also distributed in Japan by COMTEC Corporation.



The benefits of a hands free IR camera system primarily rest upon the facts that less personnel are required for fire suppression and that individuals are able to perform hand-required tasks while "seeing" in either smoke or darkness. Some of these benefits can be identified as:

- Total hands-free operation during suppression, search/rescue, and overhaul/salvage operations.
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- A quick release design that facilitates easy and fast transfer of the camera between firefighters/emergency responders.

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Thailand's Aviation Training Takes Off. . .

Aviation fire protection is a well documented and commonly discussed topic within the international arena. Global economics and trade have facilitated unprecedented growth of the aviation sector resulting in Airports becoming the transport hubs of modern life and air traffic around the world. What is clear however is that with this growth comes an increased logistical and operational consideration for aviation emergency services.

By Mat Lock

Dräger Safety Asia Pte Ltd, Singapore

It is these considerations which Wing Commander Lukchai Chaleoyprach, Vice President of the Rescue and Fire Fighting Department at Bangkok's new Suvarnabhumi Airport, must also come to grips with. With the grand opening of the new airport on the 28th September 2006 the initial phase has seen the airport handle approximately 76 movements per hour with an anticipated 45 million passengers per year. Five of its 51 gates are already equipped to handle the new Airbus A380 and the three stations of the Aircraft Rescue & Fire Fighting (ARFF) Department are manned 24 hours a day for the purpose of firefighting, rescue missions and fire prevention.

Airports are categorised on a scale of 1-10, based on the largest size of aircraft that regularly uses the Airport. The largest airports in the world at the moment are Cat. 9, but the new double-decker

Airbus A380 aircraft soon to be brought into operation shall require Cat.10 facilities. Specific standards are laid out for the emergency services for each Category, including the number of fire appliances; minimum performance levels for appliances; crewing numbers; training for fire-fighters; amount of water, foam, and other extinguishing agents; Rescue equipment to be carried; emergency access routes; and additional water supplies.

It is up to the ARFF to ensure that the standard is met at all times, and if the standard cannot be reached or maintained for some reason, then it may be necessary to divert the larger aircraft to airports that can provide the required facilities. In the case of an emergency, an aircraft may be forced to land at an airport not matching its category size.

Like all ARFF units, the crew's at Suvarnabhumi Airport, Bangkok's new International facility, may



be required to respond to fire alarms that actuate in the terminal building(s), to Road Traffic Accidents that occur on the airport grounds and to a myriad of other possible incidents that require special skills. The primary job of the ARFF is however the protection of aircraft and their occupants.

History has shown that approximately 80% of all aircraft accidents occur during the take-off and landing phase. As a result emergency personnel must receive regular response training for possible incidents that may occur. As with all training it must be realistic, safe and repeatable whilst limiting its impact on the environment.

In answer to these requirements Dräger Safety has developed a broad spectrum of turnkey aviation training systems, the very latest of which can be found at Suvarnabhumi Airport. Engineered solutions such as these help emergency personnel maintain the required state of preparedness in-line with the international regulatory requirements.

The Training Facility

Acting as the Prime Contractor, Dräger Safety was responsible for the entire co-ordination and integration of this turn-key project. They achieved project success through a carefully orchestrated combination of regional and head office support. In addition, numerous aspects of this facility were produced locally thereby demanding a solid international project management capability and cultural understanding.

The new 2.6-hectare training facility is located directly next to the new terminal and is home to three separate trainers all of which are controlled via the central computer terminal in the control building.

- Boeing 747 aviation trainer
- Fuel spill simulator
- SCBA training gallery

The Passive Aircraft Trainer (PAT)

This wide bodied, multi level aircraft trainer comes in the form of a Boeing 747 and is a full size replica of the actual aircraft. This trainer represents the

very latest of Dräger Safety's 'Passive Aircraft Trainer' (PAT) range and can be filled with cosmetic smoke for increased realism during search and rescue scenarios.

The aircraft mock-up is constructed using over 250 tonnes of corrosion resistant steel and incorporates many realistic features which enhance this modern training environment. These include a realistic compartment orientation, representative door openings, accurately scaled engine nacelles and an evacuation slide from the Gull Wing door on the upper deck. The PAT can be used to perform numerous incident scenarios and practice evacuation procedures.

Equipped with Dräger Safety respiratory equipment and thermal imaging cameras, rescue personnel comb the internal areas in the search for passengers, crew members and the cause of the incident. Numerous 75kg manikins are strategically located throughout the aircraft to add a further level of challenge and realism.

The Fuel Spill Trainer (FST)

This module simulates a fuel spill fire and is complete with a Boeing 737 replica in its centre. To maximise safety and minimise the environmental impact of this new training facility LPG Propane is used to create all flame generation – a process that requires a wide range of integrated safety systems and proven control philosophy.

With a total surface area of over 750m² it is important to ensure a realistic and versatile training environment is maintained. As a result the Dräger Safety FST incorporates a total of 66 individually controlled sections which can be operated at variable and operator selectable flame heights.

The FST also includes Dräger Safety's unique Media Detection system. A total of 132 sensors automatically detect the application of extinguishing media and cause the fire(s) to react accordingly. By harnessing the ingenuity of the computer control system the spread of fire is controlled to accurately represent the real situation.

The two most commonly used foam types are



compatible for use with the FST. These are Film-Forming Fluoroprotein (FFFP) or Aqueous Film Forming Fluorochemical (AFFF), both of which are mixed with water in a certain ratio to produce finished foam. In addition, a wide range of training foams can be used with this simulator.

As you would expect from such a large and spectacular facility, it is also important to protect the B737 mock-up from the rigours of repeated live fire training. To that end a water drenching system is installed along the length and breadth of the mock-up providing a protective film of water over the fuselage at a rate of 10.2 ltrs/min/m² in-line with NFPA 15.

SCBA Training Gallery

SCBA sets are provided to all aviation fire service operational personnel for respiratory protection from smoke, toxic fumes and other substances. As a leading manufacturer of SCBA, Dräger Safety also has a long history of supplying comprehensive training galleries to compliment this life preserving apparatus.

An additional SCBA facility was developed adjacent to the two aircraft trainers and provides heat, humidity, cosmetic smoke and confined space training together with search and rescue capabilities. This capability provides both recruit training and skills maintenance competences for Wing Commander Lukchai Chaleoyprach and his team.

"Before my personnel are deployed they have to complete this live fire training", emphasises Wing Commander Lukchai Chaleoyprach. As well as the realism of training he attaches great importance to the safety standard employed in the manufacture of the equipment. "We also practice evacuation procedures here by sending our fire fighters into the smoke logged Boeing 747. Our safety procedures allow us to maintain in constant communication with our men whilst they are inside."

The Control & Operation System

The entire facility is operated via a central computer which is located in the control room overlooking the training ground. Underpinned by an industrially proven PLC hardware configuration, the Windows based operating system provides real-time information to the controller in English, German or the local Thai language.

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is a testament to Dräger Safety's design team and engineers. Not only does the system perform self diagnostic checks to ensure full and correct system status prior to training but it also captures a wide range of data for use by the training and maintenance teams post-training.

The modern training arena remains a dynamic and exciting environment which requires continual re-assessment in the search for improved efficiencies and compliance maintenance. Occupational health and safety together with industry regulation and guidelines continue to steer this ever evolving market.

"Simply stated, airports are categorised on a scale of 1-10 based on the largest size of aircraft

they regularly cater for. The largest airports around the world, such as Suvarnabhumi Airport, are currently Cat. 9 but as the aviation industry enters a new era of aircraft design with models such as the Airbus A380, airports may be called to review their operational capacity." stated Mat Lock, Regional Manager Asia Pacific, Dräger Safety. "It is not just direct passenger and aircraft considerations that need to be catered for but emergency preparedness and training also. We are assisting many airports with their training needs analysis and allied capabilities development".

Of course, facilities such as this provide a training capability for a wider spectrum of needs than simply live fire or search and rescue training. As mentioned previously, the role of a modern aviation fire crew is varied and places demands upon their personnel and equipment. There are many ancillary applications for which this facility will be used, these include; major incident training, command and control training and counter terrorist applications. In addition, there is a need for the required support facilities to support these training activities.

"It is crucial that a holistic approach is adopted when developing any training facility. Drawing upon a wealth of experience in manufacturing personal protection and detection products, developing breathing gas and workshop systems together with a strong regional presence for project support of training facilities, Dräger Safety is becoming the natural choice for many emergency and military organisations around the world" stated Mat Lock, "Additionally, our own training and service capabilities enable us to support each installation throughout its life using our local offices and staff. This has the clear advantage of language capabilities, support response times and future system development alike'.

The Suvarnabhumi Airport training facility is one which the airport emergency services and Dräger Safety are rightly proud of. It reflects a modern and professional engineered solution in answer to the current regulatory demands of the aviation world.

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Do Type Approval Certificates Give The Entire Answer?

A reflection on chemical protective suits from the standards point of view

Chemical protective suits (CPS) are available in many different designs and materials. The decision of what CPS to use must be based on type of application and desired protection factor for the actual user.



By John F. Eklund

Senior Sales and Product Manager, Trelleborg Protective Products AB

There are CPS standards that establish minimum requirements as guideline for decision makers and first responders when evaluating/selecting CPS. These standards are good tools provided that their rather complex content is understood correctly.

The most recognised standards for CPS of 'Level A' (i.e. totally encapsulated) type suits are the American NFPA 1991 and the European EN 943. The former must be considered as the superior (i.e. most stringent) of the two, as shown in the summary comparison table.

Besides the fact that the chemical permeation resistance test criteria and test duration stipulated in the American standard is more stringent compared to the European equivalent, NFPA 1991 requires abrasion of test samples prior to the chemical permeation resistance test. This requirement is regardless of the CPS being of a 'single skin/one layer reusable' or a 'disposable/limited use' type. The EN 943 standard does not dictate any abrasion prior to the chemical resistance test.

The fact that chemical permeation tests in accordance with NFPA 1991 are made on abraded material is of great importance and advantage for the users since these results reflect the reality much better than corresponding tests made according to EN 943.

A chemical protective suit does not only represent a chemical barrier protective piece of equipment but also a working garment which will be exposed not only to contact with aggressive chemicals but to general wear and tear when operated.

Chemical resistance information based on test results made to the American standard NFPA 1991

offers greater confidence for the user since the pre-conditioning involves severe abrasion, reflecting wear and tear, which chemical protective suits are exposed to during operations and training.

Do type approval certificates give the entire answer?

The answer to this question could, in fact, be "yes and no" depending how deep we are prepared to dig into the rather complex content of the standard documents and to understand the limitation of the available options of CPS.

The market offers in principle two different approaches/solutions to meet the requirements outlined in the stringent American NFPA 1991 standard:

Option one includes suits made of delicate and fragile plastic laminate based materials which are often referred to as disposable or limited use or 'Suit-in-Suit' ensembles.

These plastic laminate based suits require a second outer aluminised protective over cover to be certified according to the American NFPA 1991 standard. The second outer aluminised protective suit not only provides flame retardant resistance properties but (more importantly and unfortunately often not known) also protection from abrasion and other physical wear and tear hazards, which these delicate and fragile multi layer thin foil laminate based materials cannot stand. Consequently, this aluminised over cover (second suit) is mandatory to meet the abrasion as well as the flame retardant requirements in the NFPA standard and to be certified to the NFPA1991.

Outside the North American market this over cover

STANDARDS ON GASTIGHT CHEMICAL PROTECTIVE CLOTHING

USA	Europe
STANDARD: NFPA 1991	STANDARD: EN943-1 and EN943-2
TEST CHEMICALS: 21 specified chemicals (15 liquids and 6 gases)	TEST CHEMICALS: EN943-1: ≥ 2 none specified chemicals EN943-2: 15 specified chemicals (12 liquids and 3 gases)
CHEMICAL RESISTANCE TEST METHOD: Permeation resistance test method; ASTM F739	CHEMICAL RESISTANCE TEST METHOD: Permeation resistance test method; EN374-3 or EN ISO 6529
DETECTION LIMIT OF PERMEATION TEST: 0,1 $\mu\text{g}/\text{cm}^2/\text{min}$	DETECTION LIMIT OF PERMEATION TEST: 1,0 $\mu\text{g}/\text{cm}^2/\text{min}$
PRECONDITIONING OF PRIMARY SUIT MATERIALS PRIOR TO PERMEATION TEST: Flexing and (!) abrasion	PRECONDITIONING OF PRIMARY SUIT MATERIALS PRIOR TO PERMEATION TEST: None
DURATION OF PERMEATION TEST: ≥ 60 min	DURATION OF PERMEATION TEST: EN943-1: 10 min EN943-2: 30 min (or if failure to pass include warning in users manual)
TEST TEMPERATURE OF CHEMICAL PERMEATION RESISTANCE TEST: $+27^\circ\text{C}$ ($+81^\circ\text{F}$)	TEST TEMPERATURE OF CHEMICAL RESISTANCE PERMEATION TEST: $+23^\circ\text{C}$ ($+73^\circ\text{F}$) or 20°C ($+68^\circ\text{F}$)
CHEMICAL RESISTANCE TEST OF ZIPPER/CLOSURE: Tested for penetration resistance for 60 min after 50 opening/closing cycles.	CHEMICAL RESISTANCE TEST OF ZIPPER/CLOSURE: Tested for permeation resistance for 5 min (no preconditioning i.e. opening/closing required). This test applies to EN943-2 only!
WARFARE AGENT RESISTANCE TEST: "Chembio" testing with five agents (permeation test method CRDC-SP-84010); min. test duration: 60 min., test temperature: $+32^\circ\text{C}$ ($+90^\circ\text{F}$) except for CK permeation test method ASTM F739)	WARFARE AGENT RESISTANCE TEST: No test stipulated.

John F. Eklund (b. 1951) is Senior Sales and Product Manager of the Trelleborg Protective Products AB, a company within the Swedish international industrial group Trelleborg AB. John is a highly qualified engineer with more than 23 years of experience in managing the development, engineering, production, marketing and sales of advanced chemical protective clothing (CPC) and other personal protective equipment (PPE).

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(i.e. second suit) is often "forgotten" by the distributors due to price and in some cases also due to ignorance. Often, the inner barrier "plastic" suit is sold without any over cover but reference is made to type approval certificates, test protocols, resistance tables etc. which are valid for the complete (Suit-in-Suit) ensemble only. A fact, which could jeopardise the safety of the wearer.

Furthermore, these limited use type of "plastic" suits are made of delicate and fragile plastic laminate based materials, which do not incorporate any strong base fabric but a non-woven "tissue" only offering very poor mechanical strength properties compared to the durable and reusable 'single skin – one layer' type of CPS which incorporate strong, safe and flexible true fabric.

The second option is the durable, robust and reusable 'single skin – one layer' type of CPS. These exclusive reusable 'single skin – one layer' suits meet or surpass all requirements of the NFPA 1991 standard, including the stringent abrasion and flame-retardant tests *without any need of an aluminised over cover i.e. second suit*. These reusable suits are made of garment materials of advanced polymeric multi layer laminates incorporating a barrier laminate and a strong, safe and flexible true base textile.

Lists of all available CPS products certified to the EN 943 by the various European notified bodies are unfortunately not available, which poses a major problem/challenge for decision makers and first responders when evaluating available certified options. Such lists of CPS products certified to NFPA 1991 exist in America and are published on the Internet. However the lists do not group or differentiate disposable or limited use (Suit-in-Suit) ensembles from reusable 'single skin – one layer' type of CPS.

Your decision and selection of CPS will not be about a piece of clothing. It will be about a life support system – your last link in your chain of protective equipment. And someone's life could depend on it.

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Jet Style Fire Helmet



Fire Helmets - the way forward

By Bob Gaskell

Helmet Integrated
Systems Ltd

Fire fighting helmets have come a long way since the days when they were made from a combination of cork, vulcanised rubber and cotton twill bonded with resins.

In the 1930's the first cork helmets were introduced to replace the impressive looking, but increasingly impracticable helmets manufactured from brass. The use of layers of cork sheet cut and glued together, was the same manufacturing process as that used for many years when making the tropical 'topee' helmet.

The use of cork gave the benefits of good shock and thermal protection combined with lighter weight and reasonable comfort to the wearer. This then established the distinctive style of helmet with a brim and comb that became the standard for use in many countries worldwide. However, the drive towards more rigorous standards of protection, with the need to improve wearer comfort and reduce through life costs, accelerated the development of fire and rescue helmets to meet these requirements.

Fortunately the availability of modern materials such as thermoplastics, composites and resin impregnated glass fibre, combined with new moulding techniques have enabled the introduction of helmets that are both lightweight, and extremely strong.

Having to be worn in arduous and hazardous conditions, there are two main criteria that establish the suitability of the modern fire helmet – the level of protection provided to the wearer and comfort and fit,

To provide protection for the face and head against a wide range of hazards such as, impact penetration and shock, fire, radiant heat, chemi-

cals, and electrocution, and to do so in varying climatic and operational conditions, places great demands on the helmet, and consequently on the design and construction process leading up to approval testing, certification, and introduction into service.

Apart from the physical protection provided by the helmet, the extent to which the helmet can be adjusted for both fit and comfort, ensures that an effective interface with a breathing apparatus facemask and protective clothing can be achieved. The helmet therefore will usually achieve this by means of an adjustable headband, forward and backward location, height adjustment capability, and a multi position brow guard angle.

In addition the construction of modern fire helmets provide the added benefits of easily replaced individual components, thereby reducing maintenance, improving hygiene and increasing service life with an associated reduction in lifetime ownership costs.

The current British/European Standard BS EN 443:1997, is an internationally accepted approval standard for fire helmets, and in common with other international standards such as AS 4067 (Australia) and includes an extensive series of tests covering, field of vision, shock absorption, resistance to sharp objects, flame resistance, radiant heat resistance, electrical properties, and retention system strength, with additional optional wet helmet and surface insulation tests.

Prior to testing the helmet is subjected to

Dual Shell Fire Helmet

pre-conditioning which will include procedures such as UV ageing, solvent conditioning, and thermal plus or minus conditioning, depending upon the specific test to be carried out. A separate standard and testing procedure applies to the helmet faceshield, the current standard being British/European Standard BS EN166: 2001, which has superseded BS EN166:1995

By nature of the varied and extreme operational conditions experienced, the fire and emergency services have particularly demanding communications requirements. Confined spaces, high temperatures, high levels of ambient noise, all combined with the stress and rigour of the work being undertaken, make good radio communications a vital necessity.

Most fire helmets can now be supplied with integral communication systems, or be capable of accepting a removable headset with microphone and receiver that can be connected to the radio via

a download and push to talk unit.

A major factor in the design of the latest fire helmets has been the requirement to reference published international anthropometrical data relating to both male and female fire fighters and rescue personnel, across a range of ethnic groups, thereby ensuring that the helmet will be suitable for international use. Consequently the latest development in fire helmets has been the introduction of dual shell types that reflect this requirement

Dual shell helmets enable the Fire and Rescue Services to use the double shell helmet when undertaking structural fire fighting operations, and use only the inner shell when attending other emergencies such as road traffic accidents, woodland fire fighting, water rescue, urban search and rescue and industrial incidents such as confined space rescue operations.

For the future the fact that several international manufacturers of fire helmets are also manufacturing helmets for military and civil aircrew means that some of the technology and operational features can cross over into the development of fire helmets.

The latest aircrew helmets such as those being developed for the Eurofighter Typhoon and Lockheed Martin F35 Joint Strike Fighter, introduce helmet mounted flight information displays, high 'g' load sealing masks with advanced communication systems, and materials which enable the helmet to be lighter and have the optimum in fit and comfort levels. Many of the requirements of an aircrew helmet mirror those of the fire helmet – impact and penetration resistance, fire and radiant heat protection, coupled with minimal physiological effect on the wearer.

It is very probable that special fire and rescue operations teams will need to use such helmets in the future. There are already major advances in the use of telemetry associated with the use of breathing apparatus and fire entry control systems; the limiting factor has always been the extra weight that ancillary equipment adds to the base equipment. The fire helmet can be an ideal platform for the addition of sensing, warning and monitoring equipment that integrate with the other protective equipment worn by the emergency services personnel.

Firefighter Footwear

Footwear specific to fire fighting has to perform various functions in what is the harshest most dangerous work environment anybody would ever face. There are important aspects to consider which combine safety & comfort of the wearer.

By Paul Bowkett

Changes

The advances in safety footwear have been vast since the days of heavy solid soles. The trend for lighter materials and comfort factors in leisure footwear generally means that this is demanded across all aspects of workplace footwear, whether it be for patrolling, construction or firefighting. Manufacturers have to find ways to develop footwear which improves the levels of safety and include those important comfort factors.

In addition to those product expectations the role of the fire fighter is changing due to the

broader variety of callouts. Wellington boots may be ok in fire or water related incidents but for Road Traffic Accidents and other rescue situations they could be totally inappropriate. Firefighters need to be fully mobile and effective in all situations they face, and would indicate the need for a multi-task solution.

Important Features

Footwear must comply with the latest safety standards, which ensure the footwear will resist a minimum level of impact and compression force. It should also allow for wearer comfort in a long

enduring shift using quality materials and innovative technology to this end.

Upper Materials

Upper materials should be considered for its resistance to hazardous environments and natural elements, but also the level of breathability it will provide. The best full grain thick leather ensures some protection from flames and water and allows the foot to breathe, rubber is fully waterproof but is often hot, sweaty and uncomfortable to wear.

The Sole

The sole is probably the most crucial element of firefighting footwear as this will have the longest contact with the ground. Procurement managers should look for a tough rubber outsole for superior durability, to resist nicks and cuts into the sole and for its higher heat resistance. The sole is also



responsible for comfort of the feet and other parts of the body. Solid rubber soles do not allow for shock absorption which can effect long term condition of knees, hips, the neck and back. Plus they are often heavy and tiring on the wearer's feet. Dual density sole combinations are commonly used which incorporate two specific layers of material, a harder dense outsole with a lower density midsole to provide a lightweight and comfortable wear.

Donning and Doffing

There is clearly an emphasis on speed in both donning in rapid callout situation and getting the footwear off easily after long hot shifts or in an emergency. There have been stories of firefighters having to be cut out of their boots after an extremely long and difficult shift, which makes this problem very real. Some premier manufacturers have considered this problem and created an elasticated, flexible ankle area in a traditional leather wellington style. This offers security whilst in action, but also makes them easy to remove. Other ideas include a lace up/zip up combination so the footwear can be tightly secured to the preferred level but also quickly zipped on and off.



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Fit

Although obvious, a good fitting boot improves the performance of a firefighter, giving them confidence in their uniform to go out and focus entirely on the job in hand. Again it is arguable that traditional rubber Wellingtons can provide an adequate fit versus other branded footwear. A good secure fit can be achieved by a fitting consultation to ascertain the correct size, and looking at zip up, lace up or elasticated grip alternatives.

Technologies

With all the essential safety features covered, fire brigades must then consider the fit and comfort factors that differ between manufacturers. The most crucial aspect is the sole where technologies may differ. Whilst there are many soling technologies, only a handful would suffice for a firefighting role. The best 'fit for purpose' firefighter

sole on the market would be the dual density rubber (DDR) sole, as it is a highly durable thick rubber sole made of two specific layers, a tough high density outsole and a lower density midlayer which provides the shock absorption and comfort. In practical terms other soles with a combination of polyurethane and rubber cannot offer the same level of protection and durability.

All firefighting footwear should also include waterproof properties which can be provided by use of waterproof membranes or rubber. Premium firefighting footwear includes systems like GORE-TEX® to provide a breathable yet waterproof solution. Generally these systems offer the best level of comfort in terms of warmth and dryness, and can prevent foot or nail diseases.

Fitting consultations are always recommended to ensure all firefighters obtain the best fitting and most comfortable boot to the correct safety standard.

Conclusion

Footwear should allow the wearer to be in complete control, so the right fit and great flexibility in a pair of boots make for important considerations. Procurement officers must not overlook comfort factors for firefighter footwear, where a lighter weight and shock absorbing rubber sole can make all the difference to the performance and long term health of the team. The right footwear offers a firefighter the optimum protection against the extreme external hazards but factors in those important comfort and flexibility features to ensure the firefighter can last the distance. It is what we have tried to do with our own Goliath firefighter range, taking in all those considerations and developing a comfortable, lightweight dual density rubber sole solution.

For further information about the Goliath Footwear range please visit www.goliath.co.uk.

Modern-day armour

A firefighters' hands are one of the most vulnerable parts of his body. Hands are used to clear debris, burning or contaminated with chemicals, blood or other pathogens. Firefighters use them to lift the injured from wreckage or fire.

Gloves that protect the user and yet still manage to be dexterous are the holy grail of fire gloves, and gloves are the most discussed items of PPE. Debates rage as to which type of glove is preferable and indeed which materials are the 'best'. The one truth that comes from all this debating is that there is not one 'magic' glove that will do it all, and gloves for fighting structural fires need different qualities from those used for extrication purposes.

We know that fire-fighters face many different hazards as part of their daily work. Solvents, chemicals and sharp objects are just as threatening as the risk of scalds and burns and firefighters are equally as likely to encounter them. Therefore all fire gloves have to provide protection against a wide variety of hazards. Of course, they must also allow the firefighter sufficient dexterity to operate all the complex machinery used in today's technologically developed fire service.

Historically, most fire brigades in the UK had

purchased gloves to the American National Fire Protection Association (NFPA) specification. The ideology behind the development of American gloves was that the thicker and harder they are, the more protection they could offer. The new European standard (EN 659), introduced in 1996, challenged this. That standard has now been refined and a further standard added – EN659:2003. This includes a number of alterations and additional tests to take into account:

There are three levels of protection applicable to an EN standard.

- 1 simple design
- 2 intermediate design
- 3 complex design

Fire-fighting gloves incorporate the highest level (3), complex design. All of the materials used in the glove, plus the actual design and structure are tested by an independent laboratory before being

By Caroline Southcombe

Southcombe Brothers Ltd

awarded the EN standard. The manufacturing of complex design products must also be certified to an approved Quality Management system.

Current thinking means that minimum performance standards have now been increased for abrasion, tear and performance standards. This ensures that gloves that meet the standard are now more robust and durable, offering greater levels of mechanical protection.

A revised version of this standard has now been accepted: EN659:2003. This includes a number of alterations and additional tests, taking into account areas that were not previously covered by the 1996 document. For example, the method given for radiant heat has been changed. The new methods given in ISO 6942 (superceding EN366) utilised a heat flux density of 40k/m^2 .

A requirement for the contact heat of a wet glove has also been included. This test takes into account the potential risk of steam burns or scalds where moisture build-up on the inside of the glove is driven to steam through external contact of the glove with hot objects.

One new and significant area which was not covered by the original version of EN659 is the potential of contact with liquid chemicals. Firefighters often find themselves in situations where accidental contact with a liquid chemical occurs. As firefighters know always too well, it is not always possible to avoid contact with these hazardous chemicals. It is essential that gloves are constructed in such a way that they provide a protective barrier against liquid chemicals. The EN368



test method is used to assess the glove against a range of chemicals: 30% sulphuric acid, 40% sodium hydroxide, 36% hydrochloric acid and heptane have been chosen to represent the most common types of chemicals that are encountered.

Taking all of the situations and hazards that today's firefighter will encounter, it is essential that hands are given the maximum amount of protection. But it is not quite as simple as layer upon layer of thick, protective fabrics. A poorly designed glove made with inferior materials can prove to be so frustrating to wear that the fire-fighter is encouraged to remove the glove in a situation that requires dexterity. For obvious and chilling reasons,

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this can be extremely dangerous. The design of a glove is of paramount importance to ensure the best possible combination of protection and dexterity.

To ensure the highest protection, it is recommended that the outer shell of the glove is made from a good quality grain leather. The first line of defence in the fire-fighting glove is the outer shell, so the need for an excellent quality protective leather is the most important requirement.

LEATHER TYPES

Pig Leather – smooth and firm, recognised by hair holes in the skin – used for cheaper leather gloves

Goat Leather – strong leather more suitable for basic working gloves

Cowhide Leather – very tough, very strong and supple. Ideal for gloves where protection and dexterity are required.

The term 'hide' describes the outer covering of large animals, i.e. cattle, while 'skin' refers to small animals e.g. sheep, goats and pigs. The characteristics of animal skins vary accordingly to the part of the world the animal lives. Generally, the temperate zones of the world provide the best environment for growth and development of livestock. The less favourable the climate and the more primitive the animal husbandry, the poorer the general condition of the animals and the lower the potential leather-making qualities of their hides and skins. The leather industry in the UK follows a strict chain of events to produce a high-quality product. Once the animal has been slaughtered, the raw hides must be preserved to stop deterioration, especially during transportation. The hides are 'fleshed' to remove the fleshy tissue on the inside. Depending on the thickness of the hide, it is then split into 2, 3 or 4 individual skins. The first and best quality leather will be the top grain side, the second or third split in the hide will result in an absorbent suede leather, with no tensile strength, mainly used for cheaper styles of fire gloves.

The next stage is adding solvents to the dye vats – these reduce the grease level to 5%, which is acceptable for dyeing. Tanning converts the raw skin into a stable material which will not putrefy, this is done with minerals such as chromium, aluminium and zirconium. Shaving the leather is done to achieve a uniform thickness for fine glove leather; this is usually 1.1mm to give adequate protection from the leather and also the highest dexterity when on the hand. The final wet process is for the hide to be dyed, this can either be surface dyed (the cheaper process) or complete penetration dyeing. Fat liquors and chemicals are also applied in this process to give flexibility and softness.

There are two basic designs for a firefighters' glove, they can use either a Gunn-cut design or a fully fitted design.

The Gunn cut design is a cheaper option, as it has only one leather centre piece to fit the sides of the two middle fingers, thus having less seams. However, the fully fitted cut design incorporates a separate piece of leather cut for each side of the fingers, thus using more leather and more stitched seams, but offering a better fit, with more dexterity. The actual cutting of the leather into the hand shapes is of vital importance. The skilled cutter must

first ensure that the hide is free from faults and scars, plus they must ensure, through stretching, that the leather has 'run', meaning that the leather is not restrictive when the hand closes into a fist shape. However, for the *length* of the glove, the stretch in the leather *must* be restrictive, you do not want the finger lengths to grow longer and longer the more times they are pulled on and off the hand.

The separate leather pieces (in some cases up to 9), are now ready to be sewn together to form the outer shell.

In a modern, protective, three-layer glove, the combination of the moisture barrier and the inner lining is very important. This barrier and lining supports the protection given by the leather shell and must be securely stitched into the tops of the fingers to ensure 100% lining retention.



The range of materials available to glove makers has undergone a revolution in the last decade. While the more traditional materials, such as cotton or nylon and pile fabrics still have a role to play, the age of the performance fabric is now with us.

Fabrics or yarns are now available which thermo-regulate, transport and manage moisture, stretch for comfort without losing shape, prevent the passage of blood-borne pathogens and even inhibit the growth of bacteria. Ideally for fire-fighting gloves you need a material constructed from aramid fibres, such as Nomex, to offer protection for the hand against thermal and mechanical hazards.

Although the EN659:2003 standard still does not have a requirement for a waterproof membrane, a good quality firefighting glove will incorporate a membrane – particularly one that is resistant to blood-borne pathogen fluids.

Gore's state-of-the-art Crosstech moisture barrier has been qualified under the NFPA standard 1971 (1997 edition). Gloves incorporating the Crosstech moisture barrier are tested to ensure it is blood, body fluid and common chemical liquid penetration resistant. In addition, these gloves will be waterproof and provide the highest level of performance, durability and breathability.

In increasingly unstable and rapidly developing times, the threat to today's firefighters has never been greater. Fire gloves are developing just as fast – when hands are fully protected, confidence grows, and if this protection can come with dexterity too, then the firefighter has an essential tool in his modern-day armour.

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Eradicating the Myths about Water Based Intumescents

By John Swindlehurst

International Sales
Director, Cafco
International

Thin-film solvent based intumescent coatings have been used for the passive fire protection of structural steel since the 1970's and many millions of square meters of steel have been protected in this way. In contrast, water based intumescent coatings, first developed in the late 1980s and introduced commercially in the 1990s, have experienced a rapid growth in use around the world and thus, are now displacing solvent based products on many projects.

This is not surprising, since there are a number of major benefits that apply to all water based products and some that are unique to individual products. It is, however, important to note that while water based products tend to get labelled as one generic group, many different formulations exist. Each product must, therefore, be considered separately in terms of its technical ability.

Unfortunately in some areas, particularly Asia and the Middle East, a number of myths and rumours have circulated regarding water based intumescents. Many have come about through general ignorance and misinformation, sometimes

promoted by the manufacturers of solvent based products. Such myths include poor resistance to humidity, slow drying, a lack of film build and reduced long term durability.

The fact is, that thousands of tons of steel have been successfully fire protected with water based intumescents during the past 10-15 years and many contractors, engineers, architects and building owners have realised the benefits of using these products.

Early water based formulations were generally restricted to 1 hour fire ratings and this limited their use. Where they were suitable, however, they provided a fast and cost-effective method of fire



protection. Many steel sections required less than 0.5 mm dry film thickness and this could be applied in a single spray application. This enabled the applicator to complete the work in a very short period, thus reducing the overall construction program.

In the late 1990s water based technology improved and products became available that were able to achieve 2 hour fire ratings and even some, limited, 3 hour options.

Safer to use

Clearly two of the main benefits of water based products are safety during application and the fact that they are more environmentally friendly. Water based products contain no hydrocarbon solvents and can therefore be used safely alongside other trades and workmen. There is no possibility of

solvent build up in confined spaces, no requirement for special flammable storage areas, which is especially important at the present time.

Faster drying times

In high ambient temperatures experienced in Asia and the Middle East, water based products will dry much faster than solvent based products. They dry by rapid evaporation of water from within the total coating layer and therefore achieve 'through drying' much faster without the formation of a surface skin.

Solvent based products, on the other hand, tend to surface-dry very quickly. Unfortunately, this process forms a hard surface skin which then slows down the escape of solvent from the rest of the coating layer. This causes the coating to remain soft for a much longer period, thus





increasing the risk of incidental damage, as well as extending the over-coating interval. The problem is compounded as higher coating thicknesses are applied.

Higher build capability

It is also possible to apply water based intumescent at high film thicknesses in one application. Because they do not skin over when drying, the high wet film thickness does not impede the through drying of the film. Since much higher thicknesses can be applied for each coat, the overall number of coats can be reduced, thus saving construction time.

Reduced over-coating intervals

As water based intumescent dry faster, over-coating times can be reduced both for second coats and for the final top-coating. This is particularly beneficial when multi coat systems are specified. As the water based coating through-dries much faster, there is much less chance of trapping any water in the film after the topcoat is applied.

It is a common problem with solvent based intumescent that, if top-coated before all the solvent has been released from the film, bubbling and blistering can occur later as the solvent tries to evaporate through the topcoat.

Resistance to humidity

Despite rumours to the contrary, water based intumescent, can withstand high humidity levels during application. Obviously, direct rain or water immersion during application or drying will affect the coating, but the solvent based intumescent are affected in the same way if they are not fully dry. Water based intumescent already contain water and as such, they are more compatible with humidity in the atmosphere.

Water based intumescent will also tolerate a

small amount of moisture on the substrate as this is absorbed into the coating and then evaporates during the normal drying process. With solvent based intumescent it is essential that they are applied to a dry substrate during application. If any moisture is present on the steel, it will form an incompatible layer between the substrate and the coating leading to loss of adhesion.

Good weather-ability

Once applied and top-coated with an approved finish, water based intumescent are able to provide good long term durability.

Although generally intended for interior use, water based intumescent have to be capable of withstanding all the environmental conditions encountered during the construction phase of a project. Experience has shown that products can be applied at an early stage of construction, without affecting the long term durability of the coating system. This practical experience is backed up by laboratory testing to international standards in both the USA and Singapore.

In Singapore, the BS 8202 test program includes exposure to a number of different environments and conditions including humidity, washing, sulphur dioxide, heat and natural exposure. After exposure to the above conditions, each section is fire tested to ensure it can still provide the expected performance.

It can be seen from the above that water based products can offer a number of tangible benefits over solvent based products, especially in hot climates. As with any specialist material, however, it is important that the products are applied in accordance with the specifications and application instructions provided by the manufacturer. Experienced and recognised applicators should always be used as they have the knowledge and technical ability to ensure a successful project.

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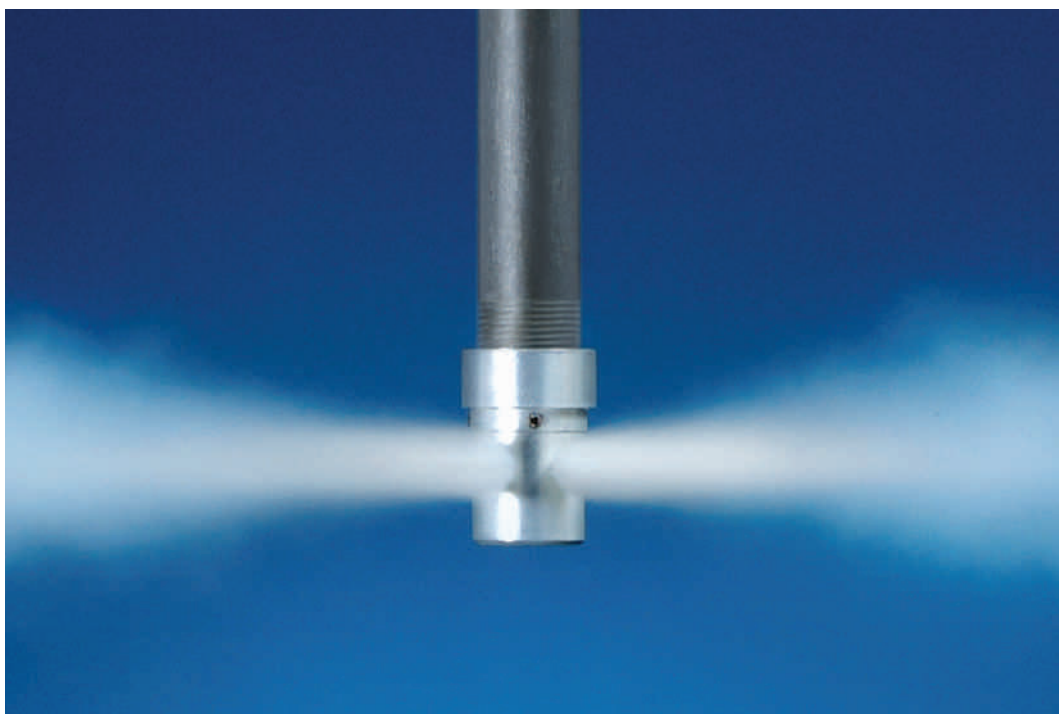
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HFC Clean Agent Fire Protection in Health Care Facilities

By Ken V. Blanchard

Global segment manager, DuPont Fire Extinguishants

In hospitals, clinics, infirmaries, hospices and doctors' offices around the world, health care administrators are responsible for protecting patients and providing a safe environment for their recuperation. In the event of a disaster, such as a fire, personal safety of patients and staff is at serious risk. Fire in health care facilities also jeopardizes high-value medical equipment that is essential to patient diagnosis and treatment.

Additionally, longer-term continuity of care is threatened when equipment is damaged or data is inaccessible, resulting in potential losses and liabilities that can extend well beyond the occurrence of a fire. The National Fire Protection Agency (NFPA) reports that during 1999-2002, an estimated average of 3,150 structure fires in health care facilities, excluding nursing homes, occurred each year. Seventy-four percent of the fires in this group were in hospitals or hospices,¹ suggesting that health care facilities face a significant threat from fire and subsequent damage.

This article will outline the key fire safety concerns, such as patient safety and potential damage

to sensitive medical equipment, that are important for health care administrators to consider when evaluating fire extinguishing solutions. It will also demonstrate how hydrofluorocarbon (HFC) clean agent fire extinguishants can address those concerns. Finally, it will describe how two health care facilities are using HFC clean agent fire extinguishants to protect staff, patients and the equipment that helps provide essential medical care.

Fire Safety Challenges

Health care administrators face several unique challenges related to protecting staff, patients and life-saving equipment from fire. Therefore, it is important to keep in mind a number of key issues



when selecting the appropriate fire extinguishant. For example, additional damage beyond heat and smoke may result from using certain extinguishants but can be minimized or avoided by using other extinguishants.

The most critical challenge in health care facilities is protecting the building occupants – staff and patients. Many patients are non-ambulatory and, due to specific medical conditions, may be unable to evacuate without assistance. In other cases, patients may require machines to assist with their breathing or monitor their heart rates, making them more difficult to mobilize in an emergency. Further, the integrity of this life-saving equipment cannot be compromised under any circumstances. Health care administrators need to give careful consideration to following best

bustion process through heat absorption and chemical interaction, thereby extinguishing fires quickly and mitigating potential effects of smoke and fire. As a result, they facilitate evacuation away from the area of the fire and lessen the longer-term effects of business loss and downtime in health care facilities.

Another challenge for health care administrators is the need to protect sensitive and high-value medical equipment. As stated earlier, according to the NFPA, during 1999-2002, an estimated 3,150 structure fires in health care facilities resulted in \$21.3 million in direct property damage.² Much of that cost likely stems from having to replace high-value diagnostic technology, such as CAT and PET scanners, X-ray machines and other specialized equipment located in emergency rooms, magnetic resonance imaging (MRI) labs and radiology departments.

Critical medical and patient records, which are often stored electronically, must also be preserved in the event of a fire. While heat and smoke are the probable cause of most fire damage, certain fire extinguishants can be just as destructive. For example, water used as a fire suppressant can cause electrical equipment to short out and rust. Dry chemical extinguishing agents leave a fine powdery residue that can corrode wiring, damaging equipment and increasing cleanup costs. Repairing or replacing damaged equipment is expensive and may require significant downtime, which is also costly. In a 500-bed hospital, technological downtime is estimated at \$264 for each minute lost.³

Electrically non-conductive and non-corrosive fire extinguishants, such as HFC clean agents, have become a best practice to minimize equipment damage in health care and other high-tech facilities. HFCs also do not leave fine powder residue behind, which helps to decrease expenses related to post-fire cleanup. Therefore, HFCs have become a preferred extinguishing option in hospitals and

The presence of combustible material, such as oxygen or alcohol, in medical facilities is another key consideration when evaluating fire extinguishing agents. These substances can add to the fuel load of a health care facility, spreading flames or causing explosions.

practices, *versus* minimum standards, to adequately protect sensitive populations and vital equipment in the event of a fire.

Water, the most commonly-used fire suppressant, can cause a range of problems for a health care facility. Specifically, it is electrically conductive and has the potential to cause electrocution to those near electrical equipment. Water damage and the potential for mold are other undesirable after-effects of water fire suppressants.

HFC clean agent fire extinguishants have become a preferred method of protection in recent years, as they are extremely effective and safe for use in areas where people are present. They are also non-conductive, minimizing the risk of electric shock. HFC clean agent fire extinguishants work at a molecular level to cease the com-

other health care facilities where electrical equipment is present.

The presence of combustible material, such as oxygen or alcohol, in medical facilities is another key consideration when evaluating fire extinguishing agents. These substances can add to the fuel load of a health care facility, spreading flames or causing explosions. As discussed above, HFC clean agent fire extinguishants are effective because they cease the combustion process by absorbing heat and prompting chemical interactions at a molecular level to extinguish fires quickly and minimize potential damage.

Finally, when health care facilities are looking for more sustainable fire protection, HFC clean agents provide a suitable option. Unlike halons, HFCs have zero ozone-depletion potential (ODP)

and are not subject to phase-out requirements dictated by the Montreal Protocol. Additionally, they can be used to replace halons in existing systems with minimal modifications.

Protecting people and the medical equipment that saves lives is a priority at health care facilities, and many facility managers are increasingly relying on HFC clean agent fire extinguishants as a best practice in safety.

HFC Clean Agent Fire Protection in Action

The case studies below demonstrate how HFC clean agents are protecting two health care facilities from fire.

Banner Good Samaritan Health Care

Banner Good Samaritan Health Care, based in Phoenix, Ariz., experienced a fire in its electrical room, which supplies all of the cooling for the facility's campus. Since the fire occurred during July, one of the hottest months in Arizona, a loss of cooling capabilities could have been disastrous, but DuPont clean agent fire extinguishants helped to minimize the damage. Banner installed DuPont™ FE-36™, which the fire department used instead of water. Using water in the electrical room would have created shorts in the wiring and could have resulted in electrocution to people in the area. As a result, they were able to extinguish the fire safely and effectively. Although Banner had to replace some equipment, their use of DuPont™ FE-36™ saved the facility thousands of dollars in damage.

Following the fire in the electrical room, Banner recommended that its more than 25 hospitals and long-term care facilities throughout Arizona switch to DuPont™ FE-36™ as a safer fire protection option, specifically for specialized diagnostic and treatment areas, such as MRI labs. Strong magnetic fields in MRI labs limit the type of fire protection system that can be used. Banner selected DuPont™ FE-36™, stored in the Ansul® CleanGuard® FE-36™ nonmagnetic container, to protect its patients and high-value imaging technologies in the event of a fire. As a result, Banner patients and visitors have peace of mind, and staff can focus on providing the best possible medical care.

Hammersmith Hospital

Similar to many other medical facilities around the world, Hammersmith Hospital in London has a busy radiology room for MRI and X-ray procedures and a corresponding data control room with sensitive electrical systems. The medical equipment housed inside these rooms was protected with a halon fire suppression system; however, as a result of the mandatory halon phase-out in Europe, the hospital's administrator needed to find an alternative fire protection solution that was just as effective as halon. This need, coupled with the responsibility of protecting patients and expensive medical equipment, influenced the Hammersmith staff to install a Fike ECARO-25™ clean agent fire protection system with DuPont™ FE-25™ clean agent fire extinguishant.

Fike and Hammersmith's business partner, Combined Protection Systems, were able to successfully retrofit the hospital's radiology and data control room with the Fike ECARO-25™ clean



agent fire protection system because DuPont™ FE-25™ clean agent fire extinguishant easily replaces Halon 1301 in existing systems with minimal system modifications. Consequently, the radiation and data control room experienced little downtime during the Fike ECARO-25™ installation, which resulted in cost savings compared to other systems. These were key success factors of the halon replacement at Hammersmith Hospital.

Conclusion

When it comes to protecting health care facilities from fire, there are many different extinguishing options from which to choose. Therefore, it is important to understand which agents will best address the unique fire challenges that hospitals, hospices and other medical facilities face, such as protecting sensitive human populations and minimizing damage to high-value medical equipment. HFC clean agent fire extinguishants are an effective solution because they have low toxicity. Because they are non-ozone depleting, they are safer for the environment than halon products. They also are electrically non-conductive, and they leave no corrosive residues that may foul life-saving medical equipment. Thus, HFC clean agents have become a preferred extinguishant option among many health care facilities due to their ability to protect what matters most – people and assets, as well as the environment. **APF**

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3. "The Toll of Downtime: A study calculates the time and money lost when automated systems go down," by Mark Anderson. April 2002.

Ken Blanchard is the global segment manager for DuPont Fire Extinguishants. He has been with DuPont for more than four years and has more than 14 years of experience in the fire protection industry. Ken is active with Halon Alternatives Research Corporation (HARC), National Fire Protection Association (NFPA), and other associations, and is based in Wilmington, Delaware. He may be contacted at kenneth.v.blanchard@usa.dupont.com



When Response Time Matters

The Nittan Model 2RA-P is a point type flame detector capable of providing a very fast response due to its high sensitivity. It is a sensor with state-of-the-art technology that drastically reduces the occurrence of false alarms whilst remaining highly sensitive.

It detects infrared energy emitted in fire and sends a signal to an automatic fire alarm system or to a fire alarm control panel.

It is capable of providing a supervision distance of 17m ~ 30m and a supervision angle of 100° Max.

For the detection of Infrared energy, a "pyro-electric effect" is used to detect the flicker frequency of the flame (1 – 10 Hz) and monitor the special characteristics of CO₂ resonant emission from the flame (wavelength of 4.3µm), as well as a non-fire-alarm discrimination wavelength region (around 4.0µm), thus, increasing the reliability of the detector with respect to false alarms.

The 2RA-P declares a fire only if the following condition is reached:

CO₂ Resonant Emission Signal level > Non Fire Alarm Signal Level.





Evolution of Fire Alarm Technology:

Interactive Firefighter's Display

By P. Ebersold

Honeywell Notifier

Envision a fire department responding to a fire alarm in the middle of the night. The facility is primarily occupied during the day, like an office building, shopping mall or industrial plant. There is no visible smoke. This building – like many others around the world – has no trained security force patrolling it, no bank of CCTV monitors being carefully watched for any sign of trouble.

Then an alarm from the fire control panel alerts the local fire department to a potential fire situation. This happens everyday to firefighters around the world. When the firefighters arrive and enter the building, they have many crucial questions:

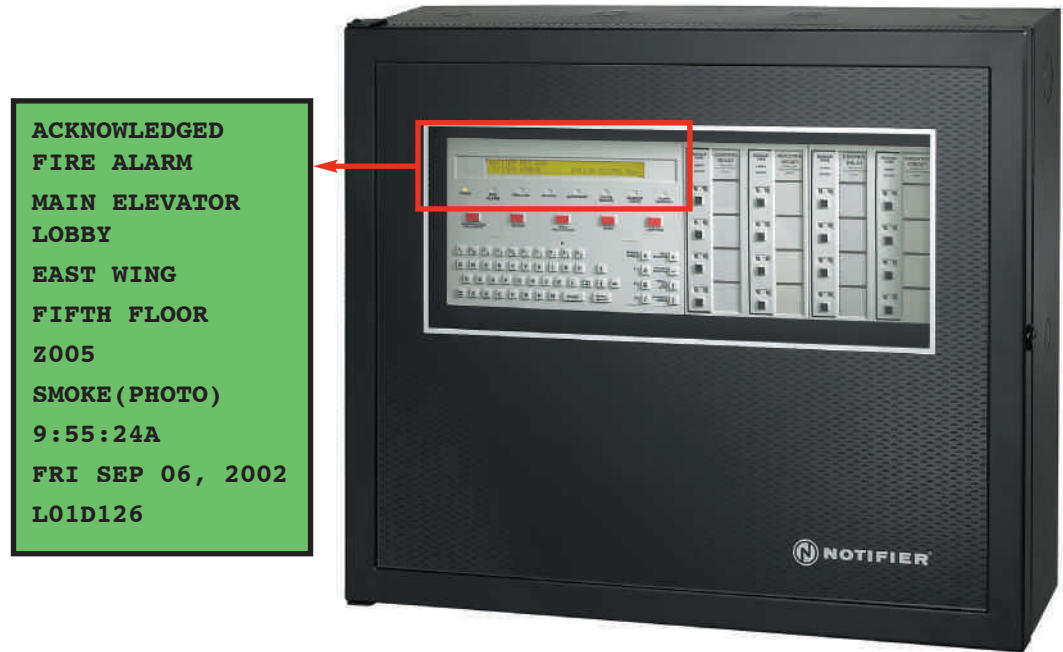
- Where is the emergency?
- Is it an actual fire event and if so, where did it start?
- How long has it been burning and which way is it spreading?
- What's the fastest way to reach people in need of aid?
- Are there any internal structural or chemical hazards?

Revolutionary Firefighter Tool

When firefighters arrive on the scene of a building fire emergency, they first must gather information to accurately assess the situation. Speed of assessment is critical. The more rapidly the origin of the fire and its progression is identified, the more effectively resources can be deployed on the fire scene. Increased speed and accuracy of response result in the potential reduction in loss of property and life.

Using a new interactive wayfinding technology, firefighters receive answers to critical questions quickly and reliably. This revolutionary touch-screen PC for firefighters simplifies emergency scene assessment by pinpointing the origin and

Figure 1



migration of a fire. The display is installed in a building lobby or main entrance to a facility. This breakthrough technology gives first responders the ability to access the information they need to perform their jobs safely, effectively and efficiently. Firefighters now have an additional tool to fight a fire, potentially reducing property loss and improving life safety for building occupants and the firefighters themselves.

The new interactive firefighter's display is housed in a rugged wall mounted box to be installed in a building's lobby or common area. The display is powered by a 24 volt power supply with battery backup. The box is locked during normal conditions and unlocks automatically once the fire alarm system is activated. The touch screen is driven by the fire alarm system. Multiple displays can be installed in any facility. For example, in sprawling industrial complexes, a touch screen display can be positioned at every major facility entrance. The display units operate separately, so unique information can be viewed on different units simultaneously.

Fire Alarm System Evolution

Fire alarm life safety systems have been moving towards more intelligence for quite some time. The dramatic shift in demand from conventional to addressable systems was driven by the need to more accurately identify the origin of a fire alarm. Addressable systems have the ability to pinpoint the origin of an alarm, whether it is an automated fire detection device such as a smoke or heat detector or a manually operated device such as a pull station. Modern addressable fire systems not only have the ability to display a description of the location but also the ability to crudely communicate the spread of the fire. The new interactive firefighters display is the next evolutionary step in intelligent fire systems.

Addressable fire alarm control panels (FACPs) were one of the first steps to assist in pinpointing the origin of a fire. With features such as custom labels, the FACP can display an alphanumeric description of the location of an activated

detector(s). This custom label information is most useful to someone who is familiar with the layout of a building such as a facility manager or maintenance personnel. Since many life safety emergencies can occur after normal working hours, building personnel may not always be on site to assist firefighters in locating a fire. The new wayfinding technology gives firefighters timely information on the origin and spread of a fire within a structure whose layout they are not likely to be familiar with.

Today, current fire alarm control panels (FACPs) and annunciation technologies in commercial buildings are a primary source of alarm information for firefighters arriving on the scene. This is particularly true at night when building occupants are not there to report their observations. Current fire alarm control panels and traditional annunciators indicate only the devices that are in alarm (see Figure 1). This sensor/detector information is given in a rather austere form. Typically, the fire panels presents activated smoke/heat detectors as items in an alphanumeric list, each activated detector described by an alphanumeric location code, and an activation time.

In order to interpret the data the firefighter must perform two tasks. First, they must translate the alphanumeric location code for each detector in the series to a location in the building. Second, in order to understand the time sequence in which the detectors were activated and hence, assess the speed of fire propagation, they must read through the times in the alphanumeric detector list and create a mental timeline. To understand both the speed and direction of fire propagation, the firefighter must do both of these simultaneously. In contrast, the firefighter display saves crucial assessment time by providing a spatial, graphical depiction of the location of activated detectors in the building and a graphical visualization of the time sequence of detector activations.

But with this new wayfinding technology, firefighters are no longer limited to fire alarm information only. Now they have the power to see virtually everything within the building that can



ONYX FirstVision™ is a revolutionary wayfinding touch screen for firefighters only from NOTIFIER.

With ONYX FirstVision firefighters can pinpoint the origin and migration of a fire right from the building's lobby.

By displaying active smoke detectors, hazardous materials locations, and other information overlaid on the building's floor plan, ONYX FirstVision gives firefighters an accurate, real-time view of the situation.

Using ONYX FirstVision, firefighters and emergency responders can make fast, effective and well-informed decisions that can reduce property loss and save lives. Take your fire alarm system to the next level.

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Figure 2

Facility Type	Why Use Wayfinding Technology?	Examples
Medium to Larger Size Buildings & Complexes	Fighting fires in larger facilities tends to be more complicated with involved building layouts.	- large distribution centers - assembly plants
High Value Buildings	Buildings occupied by a large number of people or contain extremely valuable property need fire response personnel immediately directed to the event location.	- hospitals - museums and galleries - high rise office or residential properties - sports arenas - concert halls
High Risk Buildings	When buildings have high risk and/or hazardous materials, wayfinding technology clearly shows the location of these materials on the building layout. By selecting the HazMat icon, the first responder can learn important details about the material and appropriate fire suppression technique.	- petrochemical plants - munitions manufacturing - data storage - archival storage facilities - laboratory facilities (commercial, education, forensic)
High Visibility	Businesses that can gain increased security by including wayfinding technology in the fire and life safety system.	- luxury hospitality - high rise condominiums - shopping malls - premium office space

help or hinder their response. In addition to these two major features, the display also support firefighter situation assessment by providing easy access to graphical, spatial information on the location of water supplies, evacuation routes, access routes and points, fire barriers, gas, power, and HVAC shutoffs, and chemical and structural hazards present in the building.

Designed by Firefighters, For Firefighters

When a firefighter arrives on the scene, the time required for scene size-up must be minimized while the amount of information gathered must be maximized. As a result of thorough research and extensive interviews with senior level professional firefighters, the new interactive display was developed to provide critical answers in 30-60 seconds. The display is so intuitive to use that no special training is required. Firefighters can quickly obtain crucial information about a building emergency that is easy to interpret with a spatial, graphical depiction of the location and sequence of detector activation.

When a firefighter first approaches the display, the default screen graphically identifies where active detectors are located in a structure overlaid on the building floor plan. The active detector icons flash in sequence of activation to clearly indicate fire origin and the direction which it is spreading. By selecting the active detector icon, the firefighter learns the device details and how long it has been active. On the first screen the responder has an overview of the entire building, viewing crucial data such as the number and location of all entrances and exits, offices/rooms and wall locations. Any hazardous materials in the facility are also immediately apparent with HazMat icons overlaid on the floor plan.

Firefighters have a choice of which information to access, based on what type of emergency is occurring and what their experience tells them they need to know quickly. The large display and clearly labeled icons makes it easy for fire fighters

to touch the screen and gather critical event information even while wearing thick gloves. Each screen gives maximum information with minimal navigation. In fact the user is never more than one screen away from the information they need.

And finally, all the icons used are industry standard and instantly recognizable to virtually all first response personnel. If the building is part of a new development, or if the first responder is not completely familiar with the area in which the building is located, he or she can access a site plan that shows the building's geographical location and position in relation to surrounding streets, landmarks, or other buildings. And first responders no longer need to search for emergency contact names or other important phone numbers. All this information is displayed on the contact list, which is clearly marked on the interactive touch-screen.

Applications/ Typical Installations

Because the interactive display is designed to speed up and clarify the decision making process for firefighters, the more complex the decision making process, the more valuable the system. Therefore, the system is most important to larger buildings and larger complexes/campuses.

One of the first installations of this new technology is in a science building of a university in the United States. The complex layout of the laboratory facility and the numerous hazardous materials used and stored in the laboratories make the interactive display valuable. Some other key applications are outlined in Figure 2.

Conclusion

The new firefighter's interactive display takes the information available to responding fire companies to the next level and increases the value of the fire alarm system in planning an attack on a fire. Ultimately, this new wayfinding technology assists firefighters in what they do best: evacuate the building, locate the seat of the fire and extinguish it to stop further property loss.

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* Listings and Approvals vary by system and agent.



Bronto Skylift Oy Ab

The official name of the customer: Shanghai Fire Bureau

This is a standard type of the Bronto F90HLA model with the rescue height of 90 meters and the max. horizontal outreach 29,5 meters. The max rescue cage load is 400 kg. The unit has a corrosion resistant integrated waterway and it's equipped with a Rosenbauer R600 pump and an Akron 3479 water monitor, so the extinguishing can be performed efficiently.

BRONTO SKYLIFT's HLA Range represents the ultimate in high rise rescue and fire fighting capability. Superior vertical and horizontal outreach at all heights, fast and safe operations and the integrated waterway are the main advantages of the range. Built on a standard chassis it remains compact and can reach emergency sites by using ordinary roads. The Shanghai's F 90 HLA is mounted onto Scania P420LB chassis.

The unit was delivered to Shanghai in November 2006. As a part of the delivery a thorough training course was arranged. During the training period a lot of fire officials and fire fighters from other Chinese brigades came to look at the unit, there was a great interest also shown from the city of Shanghai. All people who went up with the lift to 90 meters height were impressed by the stable movements of the lift, they all pointed out that they felt very safe, and the movements were comfortable. Of course the high outreach of the vehicle was very impressive, also the precision of the movements. They also reported the vehicle very convenient and easy to use.



The F 90 HLA unit is at the moment the highest aerial in China. Since the number of high rise buildings all over China – not only in Shanghai – is rising at amazing speed, there is a great interest for high aerals in many Chinese cities. There are already over 100 Bronto Skylift units in operation in China (the first being deliv-

ered already over 20 years ago) and the number is steadily rising.

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Metz in top form – the new L32

Design and engineering benchmarks in the aerals field

On September 29, 2006, the Karlsruhe-based, aerial ladder manufacturer Metz Aerials GmbH & Co.KG presented its latest generation of automatic, turntable ladders. Following a development period of just ten months, the new L32 made its public debut during ROSENBAUER's 140th anniversary celebrations.

With this vehicle generation, Metz has taken a further step towards top technology. The new L32 stands out due to its futuristic design, which was created by the Spirit Design company, and echoes that used for the Panther ARFF vehicles.

The design concept incorporates a new podium cover consisting of joined, extruded aluminium sections. The equipment boxes are suspended below the podium surface using ROSENBAUER's tried and tested aluminium construction method.



The available space is exploited to the best possible extent and for the first time allows the storage of the stretcher-support in a closed equipment compartment.

Metz's familiar, proven horizontal and vertical outrigger system has also been employed for the new L 32. A platform is foreseen on the right-hand side of the turret, which facilitates the storage of a generator and other equipment.

The newly developed main control seat



has been designed for the operator in line with ergonomic considerations. Its special features consist of an extremely wide seat bucket with a width of 500 mm, a high protective bar and height-adjustable back and head rests.

A swan-neck microphone with two loudspeakers on both sides is integrated into the backrest for communication purposes. The back- and armrests of the main control panel are tilted backwards by up to 30° using an electrical drive. This movement takes place in ratio to the angle of the ladder and guarantees a better view of the top of the ladder and the rescue cage. On request, a screw-on roof with additional sliding section can be added as weather protection and heated back and seat cushioning are also available.

When the vehicle is in motion, the seat is protected against dirt by the tilting forward of the backrest.

"Metz in top form" not applies to the progressive design of the new L32, but also its improved performance data. Here, an advance has been made from the production vehicle class to the "Formula 1".

The objectives of the new development were increased speed of movement and optimised, sensitive operational comfort through the use of an innovative, high performance hydraulic system. The marked performance upgrade is demonstrated by the movement speeds attained, whereby an improvement of around 25% can be assumed. This reduces the setting times of the equipment in accordance with



EN14043 to clearly under 70 seconds, which represents less than half of the minimum requirement of the current standard. As a result, Metz Aerials has created a new performance class.

As far as the controls are concerned, Metz Aerials has again installed the proven CAN bus system employed in all ROSENBAUER vehicles utilising this type of technology.

This allows the use of uniform service tools and Group-wide online service from all ROSENBAUER companies.

The tried and tested, multifunctional cage concept has been retained, with its four entries and diverse extras (e.g. a monitor, stretcher carrying and rollgliss self-rescue devices), as well as first class safety features (e.g. permanent outrigger

monitoring and the latest surveillance and lighting technologies).

As a result of its progressive design and employment of the latest technology, with the L32, Metz Aerials has established a milestone in the aerials sector. The first sales successes with Austrian voluntary fire brigades were already achieved during the development phase.

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Iveco Magirus Brandschutztechnik GmbH

Turntable ladders and Telescopic Booms from IVECO MAGIRUS – two certain ways to successful operations

For over 140 years the name MAGIRUS has been a world-wide synonym for fire brigade turntable ladders of the highest technical standard. Again and again it was the MAGIRUS brand that astonished the experts and brought groundbreaking turntable ladder configurations to market, e.g. the first ladder with low profile cab or the first articulated ladder. MAGIRUS also continuously set new rules in control technology and electronics.

Today MAGIRUS manufactures turntable ladders with 18 m up to 53 m working height which are consistently equipped with state of the art comfort and safety technology. Even the turntable ladder with 53 m working height, the longest model currently supplied, is equipped with a permanently fitted rescue cage and elevator.

The reliability and long life of the MAGIRUS turntable ladders is legendary – there is a good reason why more than 6,000 turntable ladders are currently in operation around the globe.



The MAGIRUS articulated ladder opens completely new possibilities for the operational personnel: in the meantime 250 of them have been delivered worldwide. The advantages of the articulated arm are very apparent, particularly in city centre areas, – whether in an old-town or a modern city. Protruding roofs can be avoided and dormer windows can be reached just as loggias etc. Even for under-floor operation like e.g. banks of rivers or from bridges, current operational limits are clearly exceeded.

The latest “coup” by the development engineers from Ulm is the telescopic version of the articulated ladder with which a working height of 32 m is now possible. The articulated section is 4.7 m long; the depth achievable below floor level is 8.2 m.

Complementing the turntable ladders, since a few years MAGIRUS offers also telescopic boom platforms. Then as now, the idea was not just to convert a conventional working platform to a fire-fighting vehicle; but to offer a rescue and working unit especially suited to the needs and operational requirements of the fire-brigades. From the very beginning, factors like a high safety standard, operator-friendliness and the proved and tested quality of workmanship were clear requirements on the MAGIRUS telescopic boom platforms series ALP (Aerial Ladder Platform). At present, vehicles are being built with working heights from 27 m to 54 m.

The experience gained and the suggestions from the meanwhile 140 satisfied customers world wide make it clear that MAGIRUS telescopic boom platforms are convincing particularly in the operationally relevant details. For this reason valuable insights flowed into the comprehensive new concept, which were taken up by our design engineers and put into practice.

According to the maxim “Robust like working equipment, safe as a rescue device and as intelligent as a MAGIRUS turntable ladder and reliable as the fire brigade”, the MAGIRUS telescopic boom platform ALP 375 and ALP 325 offer a multitude of bonus points:

- A large persons rescue and working cage for 4 people with opening suitable for a wheelchair, 2 multi-function columns – usable either as mounting point for stretcher holders, or for a positive pressure ventilator, descender rope or illumination equipment may also be used – as well as separate winch, monitor with permanently routed water piping and power supply for illumination and operational assignments.
- smooth, steady control of all movements even at high operational speed memory control (optional) for fully automatic return to programmed positions.
- remote diagnosis system (optional).
- ergonomically-designed operating elements (suitable for use with gloves), also on control displays on the main control stand (turret) and in the cage.

Besides this configuration, the model

series ALP 270 with 27 metres rescue height is available as an alternative. In addition to the IVECO chassis, also chassis of all main truck manufacturers can serve as basis vehicle.

As a further supplement to the standard series described, Magirus offers the alternative models ALP 340, ALP 420 and ALP 540 in the Heavy Duty range. In general these vehicles have three- or four-axle chassis. Also supplementary equipment e.g. pumps and extinguishing agent tanks are very requested options for these vehicles.

But no matter which technology you

decide upon – turntable ladder, articulated turntable ladder, or telescopic boom platform: Products from IVECO MAGIRUS are among the safest and most reliable on the market, designed and manufactured by experts for experts like you!

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Vema Lift Oy – Finland Combination Aerial Rescue Pump (CARP)

The new Combination Aerial Rescue Pump was tailor-made and jointly developed together with:

- Strathclyde FRS
- John Dennis Coachbuilders
- Godiva

The following report is taken from a presentation by Ian Morris, Head of Technical Support and Logistics, Strathclyde FRS.

In 2002 I was tasked with reviewing the performance of all “combination type” vehicles on the market to understand how Strathclyde FRS might benefit from having them in our fleet. Unfortunately, the budget didn’t stretch to Hong Kong where I understand they have been using Combi’s very successfully for several years.

Following the review, we came to two conclusions: firstly, the Combi had enormous potential to increase cover, improve safety and reduce costs and secondly, we had not seen a vehicle that completely matched our requirements. I was therefore tasked with developing a specification for a Combi that did just that.



After a lot of consultation and input from over the brigade and measuring a lot of our stations, we developed the spec. (below).

Operational/Turnout facts

- The CARP will be the 1st pump and crewed by 6 at all times.
- It will run all over the city if no other aerials are available.

Vehicle	Required	Actual
Maximum length	9.5m	9.5m
Maximum height	3.7m	3.67m
Maximum weight	26 tonnes	22.5 tonnes
Must carry all the equipment (475 items) we currently carry on our rescue pumps, so min. stowage volume	8.8m ³ –<	9.3m ³
Booms		
Minimum working height	26m	28.5m
Minimum outreach	14m	16.5m
Minimum cage load	270kg	280kg
Pump Operation		
Aerial monitor		Achieved
Three low pressure outlets		Achieved
Two hose reels		Achieved
1,500 lpm at 6.5 bar for three deliveries		Achieved
2,400 lpm at 14 bar – monitor and		Achieved
3,000 lpm at 7 bar and		Achieved
125 lpm at 25 bar for each hose reel		Achieved

- A rescue pump replaces it when it is off the run.
- It is exempt from stop duties i.e. we keep it working all the time.
- The PDA's will not be changed to accommodate the use of CARP's.
- It will carry the same amount of water as our rescue pumps but will not carry bulk foam.

Our statistics show that we have made more platform rescues using the CARP's in the first twelve months than we have using all of our other platforms combined over the last five years.

This is obviously due to the CARP being on site first and the QIC having the option to deploy the platform. We have encouraged them to look to deploy the platform rather than ladders wherever possible. As you all know, we are not exempt from the new Working at Height legislation and these vehicles clearly make it safer for our staff to work at height. We have already ordered four more CARP Mark 3's from John Dennis Coachbuilders. These incorporate improvements that we have developed through use in the field and feed back from the



users which will help improve the vehicles even further. We are also in discussion with John Dennis Coachbuilders and VEMA about the Mark 4.

Following the success of VEMA 282 ARP, new models VEMA 242 ARP and VEMA 192 ARP are to be released to the market shortly.

For more information, please contact:

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Fax: +358 10 6161 501
Website: www.vema.fi

MORITA Super Gyro Ladder MLK4-30

MORITA MLK4-30 Turn table Ladder Truck has been developed with advanced technology and new design concept. The concept of this model is Compact, Speedy and Maneuverability. Its high operation speed with a heavy duty basket of 360 kgs loading capacity can realize evacuation of multiple victims in a short time.

It shows maximum power and performance in the cities with a lot of the narrow streets in Asian countries.

FEATURES

- Heavy duty basket is an essential feature for continuous evacuation. The front step can be used easily and safely



- to access to and from a building.
- Gyro Turntable system has full automatic stabilizing.
- High speed extension mechanism allows the rescue basket to extend up to 30m high within 20 seconds.
- Operation at ladder depression up to -17° can be performed. This is useful for the rescue activities in a river or wharf accident.
- Operation pedestal adopts sophisticated ergonomic design.
- Compact size makes driving easier in urban area.

- Trouble shooting system transfers data through PC.
- PTO driven high performance mid-mounted pump can be installed in lockable storage compartment.
- Detachable Water Turret in basket.
- Teaching memory system allows to be repeated-operation easily.

For more information, please contact:

Morita Corporation
3-25-31 Nishishinbashi
Minato-Ku
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OPTIONS

- Removable stretcher can be attached to basket.



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Quick Fire Knockdown in the Modern Fire Environment:

Overpowering BTU's with Big Flows

By Chris Martin

Regional Export Sales
Manager, Elkhart Brass
Mfg. Co., Inc.

Firefighter/Engineer,
Clay Fire Territory,
Indiana, USA

Our communities are changing, they are growing, being redeveloped . . . at a rapid pace. It seems as if everywhere you look, new construction is all around us.

As new construction flourishes, we as firefighters must make it our responsibility to look at the way this changes things for us, and also maybe reexamine the way we do things. From preplanning to inspections, to emergency medical services and what we pride ourselves on best...fire attack. Fire Attack in this modern fire environment poses new challenges to us. Fires are burning hotter and faster, leaving us to often play catch up upon the arrival of the first crews. It is imperative to deploy the right size hoseline for the job, in the right location. More lives are probably saved by properly placed lines than any other means for us, as firefighters on the fireground. It is a fact that once the fire goes out, a lot of our

problems are solved, and *things are going to get better*. Fire advancement is obviously stopped, exposures are no longer at risk, and we can more safely do our jobs. In this modern fire environment, the quick attack, or "blitz" attack is gaining more and more popularity. The advancement of a fire can be stopped by the use of a high flow handline, or particularly, a portable monitor applied for mere seconds. Once the fire is "darkened" down, handlines can be advanced to fully extinguish the fire. The use of these easily deployable, high flow devices, such as lightweight portable monitors is one fire attack method that we will look at as we face this modern fire environment.

Similar to any good competitor, we must know



our opponent. In particular we are going to focus on “new” construction styles facing our communities. Not too long ago, our buildings were built of unreinforced masonry, and heavy timber construction. There was no such thing as a “lightweight” roof truss style construction, and synthetics were never even considered. Today, however, “lightweight” roof truss style construction is standard, metal studs are now being used instead of wood studs, and synthetics and plastics are preferred. As firefighters, this means to us a much greater danger on the fireground. Fires are burning much hotter, and because of this, flashover and rapid fire growth should be at the front of our minds every time we arrive. We all know from “Firefighter 101” that we use water because of its excellent ability to absorb heat (BTU’s). Well, as fires are burning hotter, we are naturally going to need more water to overcome these BTU’s. The follow-

ing indicates what we are up against:

- 1 lbs. (0.46 kgs.) of paper when burned generates roughly 2,800 BTU’s of heat
- 1 lbs. (0.46 kgs.) of wood when burned generates roughly 8,000 BTU’s of heat
- 1 lbs. (0.46 kgs.) of Polymer Plastic when burned generates roughly 22,000 BTU’s of heat

From 30 years ago to today, our building materials are now primarily synthetic and plastics. These materials burn almost 3 times hotter than materials in fires we were used to, leading to rapid flame spread and a high heat release rate as these higher fuel loads are consumed. In addition, plastic when burned, produces 300 times more smoke per pound (0.46 kgs.) compared with wood. Take these numbers and consider that buildings are now equipped with better insulation, limited ventilation, and design features such as Thermo Pane windows; fighting fires becomes increasingly more dangerous than we may have every been used to.

As firefighters now thrown into this modern fire environment, we may need to look at the way we are fighting fires. Is a 95gpm (360lpm) combination fog nozzle really the right tool we need to knock down a fire in a new construction style building? As our buildings are changing so do our tactics. One such tactic is to stop the advancement of the fire rapidly through a quick, or “blitz” attack. We just reviewed that in new building construction, fire is going to advance hotter and faster, one way to stop this is to apply a large amount of water immediately to knock down the visible fire. Remember...*when the fire goes out, everything gets better*. The quicker we do this, the quicker things are going to get better.

One way to achieve this quick knock down, fast, effectively, and with limited manpower is with a lightweight portable monitor. There are several models on the market, each with its own features and benefits; however the concept is fairly simple. A lightweight portable monitor is a portable monitor weighing less than 20 lbs (9 kgs.), with the ability to deliver around 500 gpm (1892 lpm) from one 2.5” (64mm) or 3.0” (76mm) hoseline. Often pre-connected, one firefighter can



easily deploy this monitor and have the ability to put a lot of water on the fire...fast! This attack must be coordinated with other crews on the fireground, when executed properly, a large amount of the fire will be knocked down, and *things will begin to get better*. Keep in mind, depending on the size and involvement of the fire, this quick attack will only last about 15 to 30 seconds; basically until the visible fire is "darkened down".

Once this occurs, it is then up to the crew to make entry to locate, confine, and extinguish the rest of fire. With the quick attack tactic, one is merely putting a temporary pause on the fire. It is still up to an aggressive crew to get inside and put the rest of the fire completely out. This task, however, will be significantly easier and safer as the bulk of the fire has been extinguished.

Once the quick attack has taken place, another great benefit of the lightweight portable monitor, is that it can now be used as a manifold to advance handlines from. Typically the more popular models all have a built in shutoff on the monitor. This now allows the firefighter to shut the monitor off, and attach a gated wye or reducer, and advance a handline directly from the monitor. This is an ideal setup for limited manpower crews, as a separate hose bundle can be kept, and used for this purpose. A "break apart" style nozzle combination is ideal to use in these hose packs. A "break apart" style nozzle refers to a nozzle combination consisting of a separate shutoff and nozzle tip. This way as the hoseline is advanced from the lightweight portable monitor, if additional hose is needed, the shutoff can be closed, the nozzle tip removed, and an additional hose bundle can be attached to the shutoff. This can then allow for quick advancement of additional hose, without having to shut down the entire operation.

Utilizing a gated wye essentially is now what makes this lightweight portable monitor a manifold, and an additional hose line can be attached by an additional crew. Keep in mind that certain brands come equipped with a safety shutoff off in which the monitor will shutoff when moved slightly.



This feature can pose a problem when the monitor is being used as a manifold, as it could accidentally shutoff if moved while advancing hose. It may be necessary to secure it in the open position, with a piece of rope or webbing, to ensure that your water supply is not compromised.

If used properly the lightweight portable monitor can be used as an effective and safer tactic as we now face the new enemy . . . the modern fire environment. If there is no threat to the occupants, why compromise the lives of the firefighters? With a quick attack, we minimize a lot of dangers that new style building construction poses. One way to achieve this is a rapid knock-down with a lightweight portable monitor, and then a much safer aggressive interior attack using the monitor as your water supply. This is just one more tactic for us to add to our playbook, and one that can help to make sure that everyone goes home. **APF**



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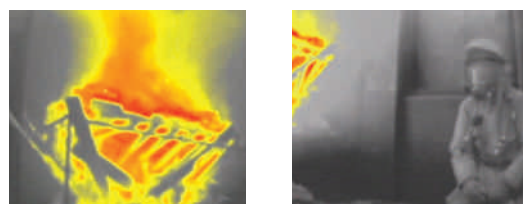
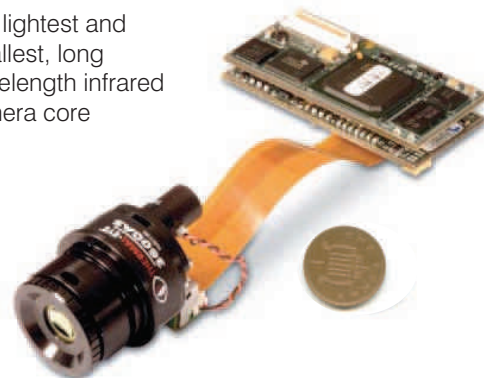
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Virtual Training:

The Realistic Option for Training of Countries

By Jack Klusters

Artesis Fire Fighting Group

Imagine!

A train station in the town centre, the train is standing still and one of the wagons is leaking. What kind of liquid is leaking out of the wagon is not clear. Passengers at the station are in panic. You can hear the sirens from the firefighters coming to the accident.

There has been a car accident on the highway. Three passenger cars, two big trucks and a mini van. The van is on his side. There are bystanders screaming for help. There are multiple injured victims and there is a car on fire. There are several people who are trying to help but the fire is holding them back.

There is black smoke coming out of the window from a house in the middle of the street. A fire is burning in the kitchen. It is night, very dark and it is raining hard. It's not clear if the family is still in the house. Neighbors are standing on the street and trying to get into the house but there is too much smoke and it is too hot. On the same moment the window is breaking, the firefighters arrive on the scene.

What do you do! How do you prepare and most importantly, how do you train for these scenarios or any other – as this specific scenario's or a million others can happen.

Fortunately the victims are not real, the fire is not hot and the smoke is not toxic. These three accidents are just a small example of what is possible with the Artesis Virtual Training Program.

Especially in the Asian pacific region training is a hot topic seen that the development of the emergency organizations are growing rapidly. This growth raises the question countries are trained adequately to deal with the available equipment, and with all possible emergency scenario's that may arise. Not all countries in the Asia Pacific region are, but how do you train the large amount of people to a specific level and keep cost within proportion. With the development of virtual training programs there may be a opportunity to deal with this.

Virtual training programs offer advantages that can change the way fireman are trained and prepared for scenarios and the proper use of equipment. Virtual training can be a big step forward and offer countries and organizations, but the programs that where around so far had limitations making it use limited. With the new developments and new technologies, is virtual training ready for large deployment and what advantages and changes will it offer? This article describes the development and what you need to know about this revolution in training.



What is Virtual Training?

Training is an essential part to be adequately prepared for incidents with which emergency personnel will be confronted. A fire department team consists of several people with everyone a different function. So to make a team function together properly, all team members need to be trained separately, and as a group. Every team member needs to know how equipment works and be able to perform his individual part. All with the objective that once an incident occurs the team is a well-organized machine where everybody functions properly and can handle any scenario adequately. Basically it comes down to the fact that everybody is comfortable in what he is doing and the tools being used.

Training is the only tool that provides that objective, but unfortunately, it is not comfortable to handle equipment and all the different possible scenarios' repetition, real live feeling and variation is necessary. Unfortunately, something that physical training cannot offer, but virtual training can. Virtual training is nothing more than a digital surrounding where numerous scenarios and procedures can be created to train an individual or team to an adequate level. It is a digital representation of the physical one, but due to the fact it is digital, it offers many advantages which we will discuss in more detail.

Any training, including virtual, can be separated into a procedure or scenario-based training.

- **Procedure:** the correct steps in a process for correct operation of a tool or specific operation like extrication.
- **Scenario:** a real life surrounding and incident to train a team to take correct actions during the whole incident.

Why Virtual Training?

Virtual training offers many advantages above other ways of training. Out of research it has been proven that approx 30% of training can be done virtual. Logically, this results in a huge saving in time and money. There is little to no need to set up trainings, which with physical training is needed. No need to put down all the necessary equipment, and no need to have the training objects in place, just to name a few. With virtual training, once the program is loaded it can replay itself over and over again. The main advantage therefore is that many people can be trained in a short period of time. A student can go on his own place and repeat a procedure over and over until the necessary level is achieved.

So besides that 30% can be trained virtual, more important is that physical training is done, it is much more effective, as the class or student is to a higher level and has the basic understanding. The main belief why virtual training can become a success is that training should start at the base (see a procedure), where you grow your knowledge over time. This base can be trained virtual! It is furthermore also a fact that lessons learned in a virtual training are better retained than theoretical lessons.

Besides the possible tremendous savings that can be achieved, virtual training also offers the possibility to train and exam people to a safe level or standard. Also in their own level from assistant to commander.

Working of a Virtual Training System

Like mentioned before, the working virtual training program is based on procedures and scenarios. Procedures for learning the correct predefined steps and scenarios for making correct choices in

a real life surrounding. This approach is based on the Dutch guidelines of training. A proven method which the Dutch fire services use reaches its high required level and maintains it. It is a collection of individual as well as group training, both on fireman and commander level.

Procedure Training

To teach the rescue workers and to let them practice the use of for example hydraulic rescue equipment, there is a possibility to use this virtual system. With this system, the men learn how to use the tools, which preparation the tools need, how to connect them properly and how to use them on a wreckage. The big advantage of this way of working is that the procedure can be repeated till the rescue workers can work with it without making any mistakes. The Virtual System helps the rescue workers to be ready for work with real incidents. The rescue workers can practice their skills on realistic designed cars.

To save victims from a car accident, there are some standard procedures. For example, how to take a door out or do a dash roll. These procedures are applicable for all car accidents. With the Virtual training these procedures can be practiced without the use of several car wrecks.

These procedures come out of the guidelines and are built in cooperation with leading manufacturers. Students therefore truly use the equipment that looks the same as they would in real life.

Scenario Training

In the virtual training world there are several different scenes to make, so the men will have a new challenge every time they use the virtual training system. Men can build specific scenarios with existing buildings, so you can practice specific needs without having to go to the building itself. The virtual practice can be done in different levels. The experience most people who have worked with this training have is that the training is lifelike and they have the same tension as when they practice outside.

Training Commander

To train the commander and to practice, the whole team has to be on the scene, without the opportunity to train the team.

This is not efficient or instructive for the team. With the use of the Artesis Virtual training system, the commander has the ability to practice his skills in a realistic environment without the rest of the team has to be present. The commander can practice on every suitable moment and can be done as many times he needs the practice.

The way the system is built it gives the commander the feeling that he is actually at the scene.

Possibilities with Artesis Virtual – scenarios and procedure practices

Artesis Virtual is the leading manufacturer when it comes to virtual training programs. In the last years they have developed a new system that uses



cutting edge technology. Let's take a look how it works.

How does the system work?

The Artesis Virtual Computer system is a stand alone system and can be placed on every location. There has been a virtual world created in the system where there can be different scenarios built in and which can be used for training in groups or alone. Procedure training a student can do by themselves.

The system exists from a computer and two screens. One screen is for the instructor and the other screen is for the student. The instructor has a keyboard and a mouse to operate the system. The instructor can design the scene and follow the student on every move.

The student has his own screen. Every order he gives his team, the instructor has to make these changes in the scene. The operation of the system is very simple.

Design your own scenarios

The system gives you the possibility to create your own scenarios. You can make virtual fires on the places you want them. You can create car crashes on very different ways. You can put tank and freight cars on every location you want or cars can be placed on his side. Every existing vehicle and rescue device is available to use on the screen.

Instructor's screen

The instructor can see on his own screen which actions his student is making and can help if the situation needs it.

The scenario can be adjusted during the training to make the scenes more difficult or even easier for the student. During the training all the details will be saved so it all can be discussed and evaluated after the training and it can be compared with previous scenarios.

The system is now used for the emergency services in The Netherlands in Dutch language and typical Dutch buildings and airports are used for this. It is very easy to adjust this to any country in the world with its own language, buildings and airports.

The system can be used mono or multi disciplinary.

The instructors for this system will receive enough training to design the scenes and to help the students through the training.

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Large-diameter Hose Solutions for Emergency Water Management

By **Mike Willson**

Product Manager,
Angus Fire

The ability to deliver water supplies where and when they are needed, in sufficient quantities and at the right pressures is today a major operational issue for municipal, industrial and aviation fire and rescue services worldwide.

Making the most of limited water supplies in rural locations is often difficult for municipal fire services because of the pressure loss problems encountered with standard fire hose. New ICAO regulations mean that airport fire services need to make provision for additional water supplies for use in fire fighting following an aircraft accident. Industrial fire services are also finding that ordinary fire hose is insufficient for feeding the latest large-capacity foam/water monitors for storage tank fire fighting.

Relay pumping outdated

Traditional solutions have centred around using existing hydrant ring main systems, bulk water storage tanks and relay pumping. Unfortunately these all have fundamental limitations. Hydrant ring mains are often old, poorly maintained and can be ruptured in an explosion. Bulk water storage tankers offer limited volumes of water and require good road access. Relay pumping can take up valuable resources in terms of manpower and vehicles and is only as reliable as its weakest link. In addition, relay pumping often generates the safety hazard of the "spaghetti effect" on the fire ground due to the many hoses needed to supply large volumes of water at sufficient pressure. This is because the pressure loss down a fire hose increases rapidly when the flow is taken above the normal acceptable limits for a standard diameter. For example, flowing 800 litres/minute of water down a 64 mm hose will produce a pressure drop of 5.6 bar over 200 metres. Imagine trying to move 20,000 litres/minute of water 1000 metres down 64 mm hoses. It is a logistical nightmare! Fortunately, the spaghetti effect can now be a thing of the past with modern Large-Diameter Hose (LDH), sometimes called Hi-Volume systems or Hi-Vol for short.

LDH is the answer

The good news is that by increasing the hose diameter, the pressure loss can be greatly reduced. A 1% increase in hose diameter results in a massive 5% drop in pressure loss. In practical terms, this means, for example, that a 125 mm diameter LDH can move the same amount of water, the same distance, with the same pressure loss as eight parallel 64 mm lines!

In order to exploit the pressure improvement

benefits of increasing the hose diameter, hose manufacturers offer a range of LDH 4 inch (102 mm), 5 inch (125 mm) and 6 inch (152 mm) diameter hoses, as well as eXtra Large Diameter Hoses (XLDH) in 8 to 12 inch (200 to 305 mm) diameters. These products solve the pressure loss problems at a stroke, but they need to be handled properly.

Nylon construction

LDH hose is no different to other layflat hoses in that they are available in a range of qualities from several manufacturers. However, the larger the diameter the more critical the hose construction becomes as there are larger volumes, weights and pressures on the fabric of the hose.

LDH should be made from specially formulated rubber blends designed to resist abrasion, heat, chemicals and oil during operational use; and UV, ozone and weathering during storage.

Polyester yarns are sometimes used, but these are more likely to result in kinking as they do not stretch under pressure. They are also unable to maximise the pressure savings down long lengths of LDH as they cannot swell. Swell is a special characteristic only found in Duraline type hoses with an all nylon jacket. Nylon is special in that it can be stretched slightly in use without breaking. This allows the best LDHs to minimise kinking, even at low operating pressures and also achieve swell, which allows the hose to stretch slightly and pass more water with lower pressure losses than polyester yarn hoses.

LDH should be made from specially formulated rubber blends designed to resist abrasion, heat, chemicals and oil during operational use; and UV, ozone and weathering during storage. This special rubber is extruded through the nylon textile jacket

Pic courtesy of Angus Fire



to make a very durable long-lasting LDH. Such hoses are generally used with Storz couplings, now the established standard coupling for LDH.

Manual handling superseded

In many cases LDH has been handled manually, but with current Manual Handling Regulations in Europe long lengths can put fire fighters at risk of injury due to the heavy weights involved. New cost-effective deployment and retrieval solutions are now available that take the physical effort out

of LDH to reach less accessible areas and feed operational personnel with reliable water flow and pressure requirements.

Planning hose configurations is carried out using a HoseCalc software program. Simply enter a hose configuration and HoseCalc carries out the pressure loss calculations to give an outlet pressure.

To store, deploy and retrieve over 1 km of 150 mm hose sounds like a major system design exercise, but with these reliable modern deployment and retrieval systems it is quick and easy to complete the task. There are now sufficient sites around the world protected with LDH that the groundbreaking engineering work needed to produce a total solution to overcome the difficulties has been achieved and FETCH is largely responsible for this significant advance. Anything up to about 4 km of LDH is normally stored flaked in a truck or demountable storage pod system. Most pod systems have a central walkway for ease of access. The hose is laid out at high speed simply by opening the rear doors of the pods, pulling out the first hose coupling manually, and then driving the

vehicle forward. The hose cascades down on to the ground and is fully deployed in a matter of minutes.

After an incident the FETCH automatic recovery system enables the hose to be picked up from the ground while the vehicle is driven slowly forward alongside it. It brings the Hi-Vol back into the storage pods with the minimum of physical effort, avoiding fatigue and injuries during emergencies and training exercises. For the first time swift deployment and rapid retrieval are achieved with

After an incident the FETCH automatic recovery system enables the hose to be picked up from the ground while the vehicle is driven slowly forward alongside it. It brings the Hi-Vol back into the storage pods with the minimum of physical effort, avoiding fatigue and injuries during emergencies and training exercises.

of using LDH, with a resulting dramatic increase in its popularity and usage. Leading municipal, industrial and aviation fire and rescue services now use LDH as a standard tool in their armoury. It can be deployed quickly at an incident and quickly retrieved using Fast Efficient Techniques for Collecting Hi-Vol (FETCH) hose systems. Fire fighters can now easily lay out a temporary ring main

the minimum of effort. Off-road versions are also available.

Custom engineered

FETCH systems are supplied as assembled skids enabling fire services to custom engineer them into their own vehicle preferences and budgets. Vehicle layouts may be sub-contracted to a third

party, built on a modified chassis by fire services engineers or designed and built by a vehicle manufacturer.

FETCH enables fire and rescue services to operate well within the Manual Handling Regulations. Gone are the days when fire crews would be expected to lift coils of hose that can weigh more than 50 kg each. With FETCH it can be done much more quickly and with less manpower.

Mounted on the front offside corner of the WSU, the compact FETCH system comprises a simple but cleverly designed twin-roller friction system. One of the large-diameter rollers is rubber-coated and the other drives a high grip conveyor belt. Drive to the rollers is provided by a geared chain, which in turn is driven by a diesel-driven hydraulic power unit fitted to the vehicle chassis.

Most fire and rescue services want a simple design with as little as possible that can go wrong in an emergency.

The unit allows couplings to pass through it without the need for any complicated electronic sensors. Most fire and rescue services want a simple design with as little as possible that can go wrong in an emergency, and if anything does go wrong they want to be able to repair it quickly in the field. FETCH has achieved this by leaving unnecessary complications out of the design that would only have made the unit less reliable and affordable.

A vehicle fitted with FETCH is capable of recovering 1 km of hose in about half an hour with minimal manpower. Water drains from the hose enabling it to be stored flat in the containers. It can also feature a special electric start diesel power pack fitted with engine over-speed shutdown system and spark arrestor exhaust that allows a vehicle to be operated in hazardous areas.

Quality LDH essential

These water management solutions are designed for emergencies, which it is hoped will never happen. This means the hose is likely to spend the majority of its life in storage, probably in a flaked condition. This puts the hose under a great deal of stress, particularly along the fold. Therefore, in exactly the same way as it is critical to choose a well designed and manufactured fire hose for first-attack fire fighting, LDH and XLDH products must be chosen with care. For LDH hose BS6391 Type 3 is the international standard to choose for your assessment criteria. Buying the cheapest hose on the market can mean that three years down the track, when maybe it is first used in an emergency, it could let you down badly and potentially put fire fighters' lives at risk. By seeking out a manufacturer with a proven track-record of supplying LDH that exceeds the requirements of BS6391 Type 3, has technical expertise in XLDH products, and makes its own deployment and retrieval systems, you are far more likely to achieve a reliable long term solution to your water supply problems.

Conclusions

Today's fire fighters need optimum flexibility. They can be called upon to assist in many kinds of emergency, including flood control and disaster relief including earthquake situations where all the established water ring main systems are broken and disrupted. Even under such demanding conditions fire fighters have a responsibility to be able not only to maintain an adequate water supply, but also to deliver ever increasing quantities of water to deal with the more complex hazards we see in the modern world. The flexibility and efficiency that modern LDH solutions now offer means that there is a flexible mobile solution available to help fire fighters to meet these tough challenges, and help them to maintain and optimise supplies of water in the widest range of emergency scenarios. **APF**

Mike Willson is Product Manager at Angus Fire responsible for the global marketing of Hi-Vol Large Diameter Hose (LDH) and associated FETCH deployment and retrieval systems. Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, which provides fire safety and security solutions to more than one million customers around the world. UTC Fire & Security is headquartered in Connecticut, USA.



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New Thinking and Cu in Emergency Comm

A large format touch screen inside the command unit is linked to sector commander tablet PCs throughout the fire ground. Command headquarters and other interested parties can also share the common operational picture from remote locations.



**By Stephen
Prendergast**

VectorCommand

New technologies are being combined to provide fire commanders with a whole new approach to incident command and control.

Current demands on fire, rescue and other emergency services have never been greater. In addition to having to prepare to respond to conventional fires, floods and other natural disasters, emergency services also need to plan, train and exercise their responses to a wide variety of terrorist threats. But whether a major emergency is fire related, a natural disaster or a terrorist incident, many aspects of emergency command and management remain the same. Commanders need to know where incidents are occurring, where their assets are deployed (and how long their assets have been deployed), and they need to be able to communicate their command decisions clearly and quickly to all command levels, sometimes over large distances.

Conventional command and control systems used by emergency services have traditionally drawn on dispatch system technology (sometimes combined with GIS mapping of varying degrees of sophistication). Command and control systems have usually adopted a top-down approach to command rather than a shared, integrated, common operational picture approach. While these systems have served their purpose for many years, they do not provide on-the-ground commanders, along with their headquarters and operational command officers, with the best array of command and control information displayed as clearly as possible by making the optimum use of modern communications, database and display technologies.

Large touch screens, networked, ruggedised tablet PCs, high bandwidth communications frequencies and systems, 'middleware' (for accessing data stored in multiple proprietary databases) and open software standards such as XML and GML, mean the traditional view of command and

control and other IT systems as separate 'stovepipes' is now completely obsolete. Most critically, continuing with such a 'stovepipe' approach prevents emergency commanders at all levels within emergency organisations from efficiently receiving and distributing, up-to-the minute incident data (asset and risk database information, live video feeds and organizational asset data) that could have a major impact on the effectiveness of an emergency response.

In the past technological limitations have meant that it has been difficult to share a common operational picture across a fire ground or other emergency area. In the case of wildfires in Australia, for example, a fireground can be up to 100 miles long and 20 miles wide, and in the case of other natural disasters, such as a tsunami, a disaster area can be even larger. Managing assets and communicating command decisions across such large areas, or smaller areas where there are complex events and issues to be managed, requires a more sophisticated approach than can be supplied by conventional command and control systems (which may sometimes only be a white board with pens), and even those which incorporate Geographic Information System mapping only may not be up to the challenge.

This has been the thinking underpinning the development of a new approach to command and control that looks at the whole process of emergency incident management in a more distributed (i.e. less hierarchical) and technological way. It is an approach which has been designed to use to the full the various open standards and new communications technologies and devices now available, as well as sophisticated systems developed to manage assets and imagery. Both

Current Developments and Command and Control

the Australian and British fire services, working in conjunction with leading British technology company VectorCommand, have contributed to the development of this new approach to command and control (now known as 'command support').

The resulting Command Support System takes emergency command and control to a whole new level. Now commanders can draw on a comprehensive range of information sources – database information, streamed video imagery, templated or ad hoc organisational asset information, GIS mapping and electronic whiteboard sketch maps (known as 'mudmaps') – to create a clear, accurate picture of an incident, and then share that information as a common operational picture on a dynamic, single screen image throughout the incident command structure, as well as back to a fire service headquarters and to other interested multi-agency organisations.

The technology is being developed for use in sophisticated mobile command vehicles but is equally useful and deployable throughout fixed command headquarters and other locations, a critical point when emergency responses to major incidents are being monitored by centralized, multi-agency political and command organisations. With Hurricane Katrina and other major incidents in mind, any future systems also have to be capable of withstanding major catastrophic threats, with multiple redundancy built in, to ensure systems continue to operate when mainstream communications systems have failed.

The company developing the Command Support System is UK-based VectorCommand, which provides a range of sophisticated, virtual reality-based training, exercising and operational command products for helping emergency services

around the world prepare and improve their staff expertise and operational command systems. Most UK, Australian and New Zealand fire services, as well as other organizations such as Qatar Petroleum and the Swedish National Rescue Services Agency, use the company's Emergency Command System range of products.

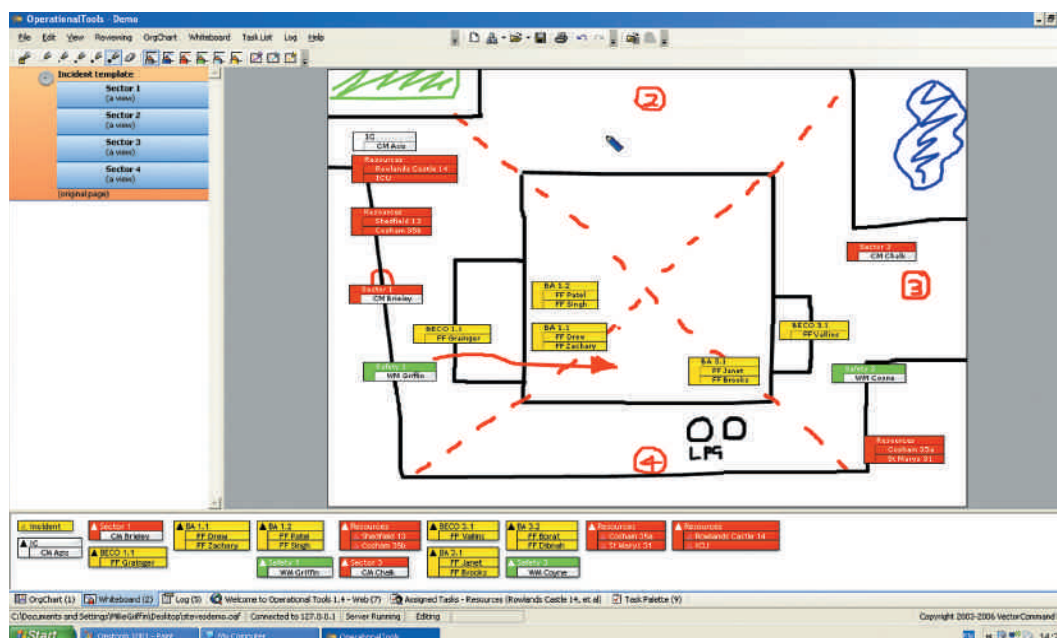
According to Dr Mike Griffin, technical director of VectorCommand: 'With the development of the Command Support System, the company is taking emergency command and control to a whole new level. We are doing this by exploiting to the full the huge potential of the latest command, control, communications and display technologies.

'Our technical and training teams have also done a great deal of work with our clients over many years, trying to understand the practical issues that they have to deal with on a day-to-day basis. One of the critical issues that they face is the question of asset management – what assets are available, where they are deployed, how long they have been deployed and when do they need to be replaced or relieved. The company has developed sophisticated systems for providing this information in easily displayed and managed digital formats, and it is this technology, combined with a number of our other proprietary technologies, that is allowing us to provide such a sophisticated solution in the Command Support System.

'Command and control can then be combined with operational and tactical training and exercising within an integrated system to provide a comprehensive solution for preparing fire and rescue service responses to a wide variety of threats. In our view, this is the future for emergency command, communications and control.'

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Air Monitoring as Part of Preparedness

By Gerd Pearson

Global Market Manager
for Fire Brigades,
Draeger Safety

Firefighters throughout the world know that the quicker they can assess what it is they are dealing with, the quicker they can start work. Smoke and flames are relatively easy to see, unlike the invisible dangers that often accompany toxic or flammable gases. A source of ignition at the wrong time, or entry into a potentially lethal atmosphere could turn an incident into a full blown disaster.

Even if every firefighter were to don compressed air breathing apparatus for every single incident, the need for gas detection systems would still exist. Gases, particularly those from chemical and industrial plants, can have far reaching effects, from the poisoning of nearby personnel through to widespread environmental pollution. They can also have explosive consequences. The use of the right gas detection system will quickly determine the type and level of risk and allow the firefighter to do what they do best – resolve the situation with the utmost safety for all concerned.

The nature of the incident can sometimes point to the type of hazard that may be found and might provide a useful insight into which type of gas detection system may be required. An earthquake or other natural disaster, for example, might involve town gas, methane, hydrogen sulphide, sulphur dioxide, carbon monoxide or, perhaps, a lack of oxygen altogether. A terrorist incident might feature nuclear, biological or chemical hazards, whilst a wide variety of gases and vapours can be found at different industrial sites.

For instance, in the brewing industry where increased levels of nitrogen are now being used to make a more effervescent beer, there is a danger of oxygen depletion and, as a result, asphyxiation. Colourless, inert and odourless, liquid nitrogen is also used as a freezing agent in hospitals, laboratories and universities. A firefighter entering a confined space or enclosed area in the danger zone could find him or herself with a severe case of oxygen deprivation.

In steelworks, a volatile mix of oxygen and carbon monoxide can create serious blast levels and even the semiconductor industry has its own potential toxicity problems with the use of ammonia, arsine and bromine. A “shout” at a food processing plant could involve high levels of disinfectants or, in refrigeration and cold storage areas, unhealthy levels of ammonia. To compound the problem, it is also possible that toxic and/or flammable gases and vapours that were created during previous work might still be present, or that hazardous bi-products may be created by the fire itself from otherwise non-hazardous materials.

Whilst not exhaustive, the following lists some of the most common substances that may be encountered:

combustion of polyurethane foams, for instance, include giddiness and headaches before eventual collapse. Exposure to a high concentration of

SOURCE	SUBSTANCE
Combustion processes such as open fire, tobacco smoke. Vehicle exhaust gas	CO ₂ , CO, Nox
Cleaning agents, disinfectants, furniture polish, stain removers, shoe polish spray, nail polish remover, correction liquids, pickling agents.	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde and other aldehydes, acetone
Glues and paints	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde, other aldehydes
Insulating material, foams, damping material, chipboards	Styrene, formaldehyde
Gasoline stations	Toluene, benzene and other aromatics, hexane and other aliphatic hydrocarbons
Refrigerants, anti-oxidant in metal furnaces	Ammonia
Food processing, magnesium foundries	Sulphur dioxide
Semi-conductor manufacture & rework	Ammonia, bromine, hydrogen chloride, hydrogen cyanide
Paper and man-made fibres	Chlorine
Decomposing biological matter	Methane, H ₂ S, oxygen deficiency

Hazards and effects

Many gases and vapours are toxic, can cause oxygen deficiency or carry the risk of explosion and, as a result can prove to be lethal.

In respiratory terms, different hazards have different effects and are classified as follows:

Simple Asphyxiants

Inhalation of substances in this category is not usually life-threatening but the presence of a simple asphyxiant can displace oxygen in the air to such an extent that the lack of oxygen can, in itself, be dangerous. Carbon dioxide is a typical example and whilst exposure to low levels can lead to breathlessness, high concentrations can cause loss of consciousness within just 60 seconds.

Chemical Asphyxiants

Unlike other asphyxiants, these can be immediately dangerous to life and health in that they interfere with the transportation of oxygen within the body. Symptoms following exposure to carbon monoxide and hydrogen sulphide, which is produced by the

hydrogen sulphide will cause an immediate paralytic effect on the respiratory system.

Irritants

Ulceration of the throat, watering eyes, sneezing and coughing are just some of the immediate symptoms that can follow exposure to irritants such as ammonia, chlorine and sulphur dioxide. Where escape is difficult, breathing can become severely restricted and exposure could prove fatal.

Narcotics

Hallucinations can follow exposure to high concentrations of toluene and other narcotic substances such as tetrachloroethylene.

Combination hazards exist in many situations and, as well as being potentially explosive or flammable in nature can make search and rescue operations very difficult indeed.

Different types of systems

The incident and location will automatically reveal a certain amount of information about the types of hazards that are most likely to be found. However, firefighters entering a potentially hazardous environment need to know exactly which gases are involved there and then, not just for their own safety but for the well being of those they may need to rescue.

Designed to detect airborne substances and to sound a warning if the levels pose a threat to health, portable gas detection instruments can be used to determine if an area is safe to enter, whether it remains safe during rescue or recovery and, after clean-up, can ensure that decontamination has been complete. Whether the hazard is toxic, explosive, combustible, asphyxiating



or a combination of any of those, there is an instrument to suit every situation.

Tubes

Short term tubes provide on-the-spot measurements of targeted gases and are suitable for monitoring personal exposure, spot check measurements, leak checks and confined space investigation. Developed by Draeger in 1937, for example, Draeger Tubes lead the way in tube technology and enable the fast, accurate measurement of over 1000 substances, including chemical warfare agents.

These highly accurate glass tubes can also be used in conjunction with short term pumps to enable rapid measurements to be taken and provide optimum volume and flow specifications. Incorporating automatic stroke counters and a clear end of stroke indicator, pumps require no special tools and give accurate and reproducible results.

Personal Single Gas Monitors

These handheld instruments can monitor a broad range of gases and can be supplied with interchangeable sensors to detect specific substances. Portable instruments of this kind obviously need to be lightweight, easy to read and easy to use, even when wearing gloves and the alarms should be heard, seen or felt in the most arduous of conditions.

Multi-Gas Measurements

These high performance instruments can be used to measure a wide variety of gases in virtually any situation, from indoor air quality through to confined space entry and the monitoring of landfill gas. The more modern units can provide continuous detection of up to five gases simultaneously and feature individually adjustable visual and acoustic alarms.

As each sensor is pre-calibrated and is recognised automatically by the instrument, this innovative instrument can be reconfigured simply by changing a sensor and without requiring additional service or maintenance. In addition, the measuring range of these sensors can be changed to any other gas detected by that sensor, by the push of a button and without needing recalibration. As a result, the accuracy and range of the monitored substance is substantially increased. The search for leaks in flanges, shut off devices and valves, etc., has also been simplified by the addition of a new, flexible gooseneck probe. When in tracking mode, it generates an increasing or decreasing rate of beeps in accordance with the gas concentration detected.

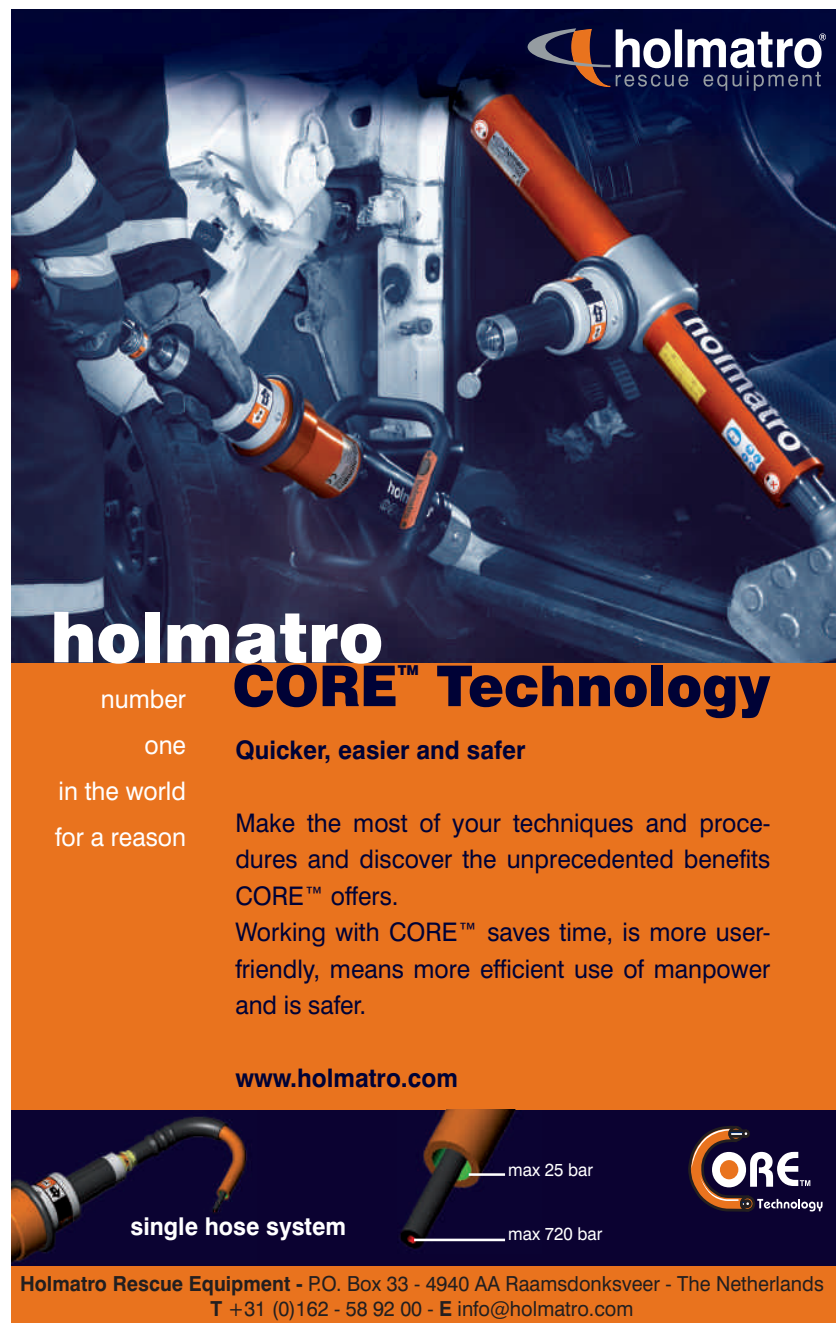
Other specially designed "two-in one" instruments are also available for use where combination hazards involving explosive gases and a lack or surplus of oxygen may exist. For maximum flexibility, the Draeger PacEx2, for instance, can be supplied in two versions: as an instrument for explosive gas measurement, or as a "plug and play", combination instrument for explosive gas and oxygen measurement. Combining extended operational time with minimal training and charging requirements, it features "smart" technology and is designed to monitor hazard concentrations continuously, simultaneously and independently.

Utilising three functional pushbutton controls, this rugged instrument is operational as soon as

the sensors are plugged into the instrument and has a short response time.

Each of these multi-functional instruments can also be fitted with a hose or pump for active sampling in hard to reach areas. Where record keeping is a requirement, they can also be supplied with dataloggers.

Domestic preparedness has come to the fore in recent years, as the dangers of chemical and biological agents have become more of a concern. Providing continuous measurement in real-time, the Draeger Multi-IMS, for example, is easy to use and will quickly detect a wide range of chemical warfare agents. Utilising the latest state-of-the-art handheld detection and monitoring technology, it incorporates a sensor based on Open Loop Ion Mobility Spectrometry and uses an ION Mobility Cell to provide improved sensitivity and selectivity. Concentration, trend and relative dosage measurements are easily taken and a range of



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graphical alarms indicate both the substance and concentration level as well as the hazard type, i.e. nerve, blister or blood/choking agent. Bar graph displays clearly show the current concentration levels as well as alarm volume and battery status. With a built-in pump and RS232 datalogging interface, it also features audible and visual alarms and an automatic self-check.

Photo ionisation detectors (PID) are perfect for tracing volatile organic substances in air. Able to detect whole groups of substances, these multi-functional, robust instruments can also be calibrated to monitor individual hazards. Especially useful in confined space measurements and emissions monitoring, they can also assist in fire investigation and in post-accident screening.

Fixed Gas Detection Systems

Designed to constantly monitor and detect explosive or toxic gases and vapours as well as oxygen deficiency and/or enrichment, these sophisticated systems can be used to sound alarms and initiate evacuation, or to switch off entire processes in the event of a problem. Used to monitor remote areas and/or multiple sites, their data is recorded which means that they can provide valuable incident information before fighters even arrive at the scene.

Providing round the clock protection for, amongst others, the petrochem, food processing and chemical industries, they are also widely used in large commercial sites and sports or leisure venues.

Firefighters have a need for rapid and accurate information about the nature of the incident. Once armed with the facts, they can respond to the numerous challenges that arise both quickly and competently. Fulfilling a vital role, gas detection systems can be used to eliminate the risks and increase awareness of the dangers.

Useful information for firefighters – sensor positioning

It makes sense that sensors and sampling points are positioned so that gas accumulations are detected before they create a significant hazard. To ensure

maximum performance, different sensor positioning strategies can be implemented to suit different workplace environments. Whilst these can, of course, be combined or modified, they are generally used to provide spot, area or perimeter monitoring.

Spot monitoring is used where the potential source of the leak is known and the sensors can be positioned to ensure that leaks are detected quickly. Area monitoring requires an increased number of sensors to cover an entire area and is generally used where the source of the leak is not known. Perimeter monitoring is used in applications where the outer limits of the installation need to be checked and where it is important that potential hazardous gases do not reach neighbouring areas.

European Standard BSEN 50073:2000 lists a number of factors that should be taken into account when determining suitable locations. These include the location, i.e. indoor or outdoor site, potential sources such as the location and nature of the potential vapour/gas sources (pressure volume and/or mass, source temperature, density and distances), as well as the chemical and physical data of the potential gases/vapours present.

Other factors include leak control, the nature and concentrations of possible gas releases, the presence of cavities and jets and the general topography of the site. Air movements should also be taken into consideration as well as temperature effects, the local environment of the plant, the location and number of personnel in the plant and the location of potential sources of ignition. Any structural arrangements such as walls, troughs or partitions, which could allow gas to accumulate, should also be considered.

Perhaps most importantly, the Standard also states that the placement of the sensors and sampling points should be determined following the advice of experts having specialist knowledge of gas dispersion, experts with a knowledge of the process plant system and equipment involved, and safety and engineering personnel. It also advises that the agreement reached on the locations of sensors and sampling points should be recorded.

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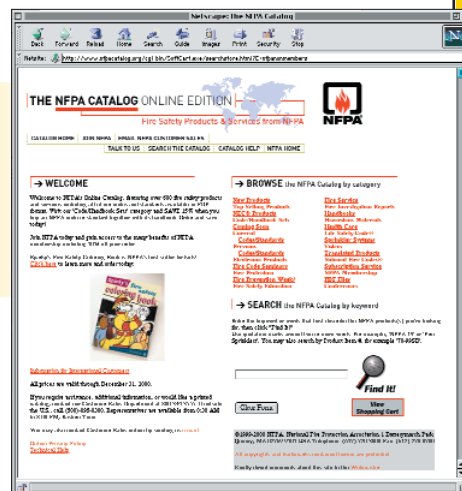
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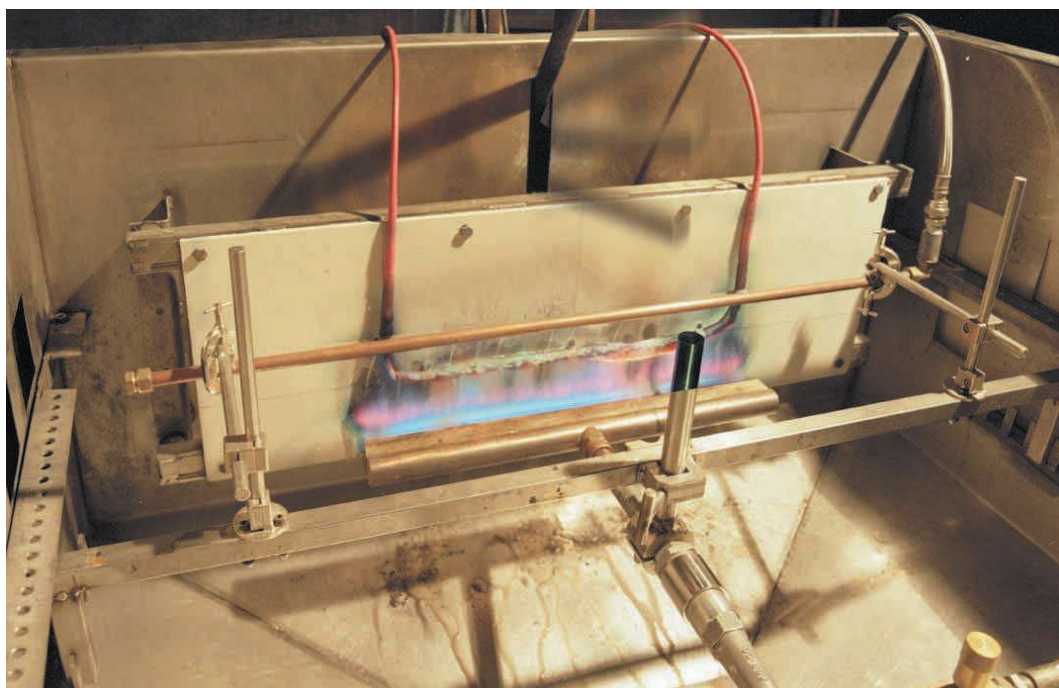
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Fire Performance Cables

– assessing the standards internationally

The development of cables with improved fire performance has been ongoing for over 20 years and continues apace today on a global basis, along with the evaluation of product standards and performance standards. These moves have resulted in considerable improvements in fire safety, particularly in environments where public safety is concerned, such as public assembly, in the mass transit sector, maritime applications and throughout the offshore industry. David Oldfield, Product Development Manager at Draka UK explains that changes in cable fire performance requirements are being introduced into the Middle East sector and most notably in the adoption of products meeting the requirements of B.S. 5839-1:2002 rather than reliance on earlier standards e.g. B.S.6387 CWZ.

By David Oldfield

Product Development
Manager, Draka UK

The development of reduced fire hazard cables has eliminated the problems associated with the combustion of halogenated polymeric materials that were used in the manufacture of many earlier generation products. Zero Halogen Low Smoke – OHLS – cables are now freely available, in a variety of wiring and power designs, to suit all building applications and their performance is recognised internationally as making a major contribution to fire safety in public buildings.

In Europe, the UK led the way in the adoption of reduced fire hazard cabling, and in devising a comprehensive set of cable performance testing

standards. These standards include requirements for smoke production, acidity evaluation, flame retardancy and, in appropriate cases, for assessing the circuit integrity of cable. One very recent milestone was the decision of the EC Standing Committee on Construction to establish a classification table for cables in buildings, under the provision of the Construction Products Directive. This table defines classes of cable fire performance in terms of flammability, smoke production, flaming particles and acidity.

A new fire test protocol has been prepared as part of EN50399-2007; Common Test Methods for



Cables under Fire Conditions. This assesses performance against the classification table and is based on a modification to the IEC 60332: Test on Electric and Optical Fibre Cables under Fire Conditions, test for the vertical propagation of flame. The test measures fire growth rate, total heat release and peak heat release, in addition to other criteria such as flame spread, which is the main concern of the existing IEC (International Electrotechnical Commission) test. This new test enables more definitive comparisons to be made between cable types. However, the extent to which the provisions of EN50399-2007 are embodied in regulation remains to be defined.

The importance of circuit integrity

As the latest revision of UK legislation relating to the fire performance of fire alarm cables has now been around for a few years, the majority of specifiers and installers are familiar with its main requirements. However, the availability on the market of an increasing number of cables, coupled with a growing international awareness for the need to adopt what might be described as “best practices” means that it is high time for a number of important issues to be finally resolved.

So, what needs to be addressed? Certainly it is essential to move quickly to a point where specifiers and installers can confidently rely on manufacturers’ cable ratings; cable fixing needs to be consistently undertaken to a higher standard; manufacturers’

recommendations regarding the bending of cables must be adhered to, and cable jointing needs to be undertaken to a standard that does not potentially impair the installations’ integrity.

But first, before turning to these issues, let us take a brief look at some of the latest fire performance cabling solutions that have come onto the market in the past few years.

New fire performance cable solutions

In the UK, for example, fire performance cables now fall into two categories, defined as Standard and Enhanced. These performance levels are determined by testing procedures described in BS EN 50200: 2000 (Method of Test for Resistance to Fire of Unprotected Small Cables for use in Emergency Circuits) and BS8434: 2003 (Methods of Test for Assessment of the Fire Integrity of Electric Cables). Standard cable is acceptable for the majority of installations, whereas Enhanced cable is required in clearly prescribed buildings. These are: buildings where cables are required to operate longer due to phased evacuation; buildings over 30 metres high that are not protected by sprinklers; buildings with critical signal paths to areas where people may remain for some time during a fire; and buildings where a fire risk assessment identifies the need for enhanced performance. Indeed, demand for this Enhanced cable is expected to grow with the increased international trend for buildings to be designed along fire safety engineering principles,

rather than prescribed measures.

Fire integrity is essential for cables used in fire detection and alarm systems, emergency lighting and public address installations, and where providing power to other fire safety systems. Modern systems used in buildings, where increasingly fire engineering principles are linked to fire risk assessments, are often complex and critical, and the systems frequently need to function for a considerable period of time after a fire has been detected.

This led to the introduction of new levels of circuit integrity in the 2002 revisions of BS 5839 (Fire Detection and Alarm Systems for Buildings), with the rating for Standard cable being set at 30 minutes and at 120 minutes for Enhanced cable. The test protocols differ significantly from those in BS 6387 (Specification for Performance Requirements for Cables Required to Maintain Circuit Integrity under Fire Conditions), by being “integrated”, by simultaneously applying fire, mechanical shock and water exposure to the cable sample.

Cable performance for critical systems

Fire performance data cables are now an emerging reality and data transmission performance criteria have been drafted. At the same time, changes to alarm cable fire performance are now well established and understood and it is widely recognised that significant improvements in cable reliability have been achieved. Hence, attention has recently been focussed on the performance of cables providing essential power supplies to other critical fire safety systems.

Systems for smoke control and ventilation incorporate dampers, shutters, automatic door hold-open devices, fans and vents, all of which require secure power supplies during the evacuation and fire fighting phases. These means of escape need to be indicated by appropriate illumination and secure emergency lighting. Also, firefighting facilities require secure power supplies and fire fighting lifts and rising mains need to function longer than most other systems.

The design and performance requirements for fire integrity power cables in the UK market was established in 1996 with the publication of BS 7846 (Electric Cables), and the market for this type of cable is currently satisfied by the “F2” performance classification. This standard has in recent years been subjected to similar criticism to that directed at BS 6387 regarding lack of integration of the test elements. In addition, recommendations have also been put forward for the need for more direct impact and higher pressure water applications. Advocating these more stringent requirements led to the publication of BS 7346-6 in 2005 (Components for Smoke and Heat Control Systems – Specification for Cable Systems).

This test applies direct mechanical impact to the cable under fire conditions and also applies water at the end of the test period, simulating of a fire hose. This requirement has been adopted for all essential fire safety system applications in the UK and will surely give rise to the introduction of new products to comply with the exacting standards.

The need for integrated testing

There is increasing recognition of the importance of the fire performance of the “cable system” in

providing an adequate level of safety, and BS 5839-1: 2002 defines this as the cable, any joints, and the means of cable support. Hence, a key recommendation is that the performance of all of these “cable system” elements should mirror the performance of the cable, and that the cable manufacturer’s recommendations should be followed or the manufacturer’s guidance should be sought.

In Europe, tests to assess the performance of cable systems are the exception rather than the rule, and certainly no harmonised standard currently exists. That said, there is an SCC (Standing Committee on Construction) Mandate M117 for the investigation of large scale testing, including system elements, and a working party will soon be established to conduct the investigation.

Internationally, there is presently only one reference point for a large scale circuit integrity test for cables and their installation ancillaries, and this is the German standard DIN4102-12 (Fire Behaviour of Building Materials and Building Components), a furnace test that subjects the cable to a temperature rise with respect to time, in accordance with the ISO Curve. Ratings are assigned as of 30, 60 or 90 minutes. The furnace is oil fired and simulates fire conditions similar to those found in a fully developed building fire. Cables are installed, together with appropriate trays, cleats or ladders, and these are loaded to their full rating by the application of appropriate weights. Onerous though this large scale test is, significantly the cables are not exposed to the application of water to stimulate sprinklers or firefighting activities.

It will no doubt be several years before the results of these investigations are embodied in a European standard, but one thing is certain – the continuing drive to improve standards and produce cables that continue to enhance the safety for people and property.

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David Oldfield is Product Development Manager at Draka UK and has been involved in the design and manufacture of electric cables for the past 35 years.

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Dealer/Distributor

ANSUL INCORPORATED

INDONESIA

ANSUL INCORPORATED

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Representative Office

BAUER COMPRESSORS

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Dealer/Distributor**MOUNT EVEREST ENGINEERING COMPANY**

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Dealer/Distributor**INDONESIA****MARINE & INDUSTRIAL COMPRESSORS**

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Dealer/Distributor**JAPAN****BAUER COMPRESSORS CO. LTD**

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Representative Office**KOREA (SOUTH)****TECKO CO. LTD.**

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Dealer/Distributor**MALAYSIA****SK CRYOGENICS SDN BHD**

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Dealer/Distributor**PHILIPPINES****CEBU ERNBRI IMPORT, INC/AQUAVENTURE WHITETIP DIVE SUPPLY**

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Unit 101 Joncor II Bldg, #1362 A.Mabini Street
Ermita Manila, Philippines 1000, Philippines
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Email: www.bauer-kompressoren.de/sales/bcmail_en.php?id=233>

Website: www.3arrow.com.tw

Dealer/Distributor**THAILAND****INTERSON ENGINEERING & TECHNOLOGY PTE LTD**

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Dealer/Distributor**VIETNAM****MEKONG SCUBA SUPPLY LTD.**

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Website: www.foremostsafety.com
Dealer/Distributor

JAPAN**CORNES DODWELL LTD (OSAKA)**

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Website: www.cornes-dodwell.co.jp
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KOREA (SOUTH)**GODO ENGINEERING CO LTD**

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Tel: 822-3141-1236
Fax: 822-3141-1270
Email: info@godoeng.com
Website: www.godoeng.com
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ELKHART BRASS**AUSTRALIA****FIRE RESPONSE PTY LTD**

71 Prince William Dr, P.O. Box 668, Seven Hills
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INDONESIA**PT REJECKI UTAMA**

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NEW ZEALAND**PSL PHILLIPS & SMITH LTD**

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Tel: +64 9 8184484
Dealer/Distributor

THAILAND**GUARDFIRE LIMITED**

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Dealer/Distributor

FIRE FIGHTING ENTERPRISES**AUSTRALIA****AMPAC INDUSTRIES PTY LTD**

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Fax: 00 61 892 423 334
Dealer/Distributor

HONG KONG**HLK SERVICES LTD**

Room 1111, Tower B, Hung Hom Commercial Centre, 39 Ma Tau Wai Road
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Tel: 00 852 23303083
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Dealer/Distributor**INDIA****NITIN FIRE PROTECTION INDUSTRIES LTD**

501, Delta, Technology St.
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Powai, Mumbai -400 076, India
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Dealer/Distributor**KOREA (SOUTH)****HI MAX CO LTD**

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Sangdaewon-Dong,
Jungwon-Gu, Sungnam-City
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E-Mail: khkim@himax119.co.kr

Dealer/Distributor**MALAYSIA****FITTERS ENG.SERVS SDN BHD**

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Kuala Lumpur, Malaysia
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Dealer/Distributor**NEW ZEALAND****AMPAC INDUSTRIES LIMITED**

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North Shore Mail Centre
Glenfield, Auckland
New Zealand
Tel: 00 64 94438072
Fax: 00 64 94438073

Dealer/Distributor**SINGAPORE****ACCLAIM SYSTEMS PTE LTD**

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Singapore 339775
Tel: 00 656 2990 798
Fax: 00 656 299 3735

Dealer/Distributor**ALARM SUPPLY PTE LTD**

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03-07 Pemimpin Industrial Building
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Fax: 00 656 258 6428

Dealer/Distributor**TAIWAN****HORING LIH IND CO LTD**

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Email: ahtaipei@me26.hinet.net

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Fax: 00 66 2 3811197

Dealer/Distributor**TEEYA MASTER SYSTS CO LTD**

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Fax: 00 662 2 2488540

Dealer/Distributor**HELMET INTEGRATED SYSTEMS****AUSTRALIA****CHUBB FIRE AUSTRALIA**

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Dealer/Distributor**BRUNEI****GLAMCO AVIATION (B) SDN BHD**

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Hong Kong

Dealer/Distributor**INDIA****VIJAY SABRE SAFETY PVT LTD**

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Dealer/Distributor**SINGAPORE****PROGRESSIVE INDUSTRIAL EQUIPMENT COMPANY**

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Dealer/Distributor**PHILIPPINES****ALLIANCE INDUSTRIAL SALES**

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Dealer/Distributor**KERR****AUSTRALIA****FIRE RESPONSE PTY LTD**

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Dealer/Distributor**INDIA****NITIN FIRE PROTECTION INDUSTRIES LIMITED**

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MALAYSIA**DASAPREM (M) SDN BHD**

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ADVERTISERS' INDEX

Ansul, Inc.	OBC
Bauer Compressors Asia Pte Ltd.	09
Bio-Ex	25
Bristol Uniforms Ltd.	33
BW Technologies	70
Chemetron Fire Systems	IBC
Dafo Fomtec	15
Draeger Safety Asia Pte Ltd.	20
Dr. Sthamer Hamburg	23
Du Pont FE	04
Du Pont Surface Protection Solutions	19
E2V Technologies	29
Elkhart Brass Mfg Co Inc	56
Fire Fighting Enterprises	64
Firetrace International	51
GB Solo Ltd.	60
Helmet Integrated Systems Ltd.	35
Holmatro Rescue Equipment	73
Honeywell Fire Systems	49
International Water Mist Conference	06
Kidde Fire Protection	42
Lancier Hydraulik Co. KG	67
NFPA	76
Nittan UK Ltd.	46
Plastika Akrapovic	30
PPS Ltd.	28
Resqtec Zumro Asia Sdn Bhd	64
Sage Technologies Ltd.	09
Securiton AG	49
Sicor Spa	37
Solberg Scandinavian	15
Task Force Tips, Inc.	IFC
Texas A & M Emergency Services Training Institute	25
Trelleborg Protective Products	26
Tyco Safety Products – Skum	75
Vetrotech Saint Gobain International AG	38
Wolf Safety Lamp Company	15

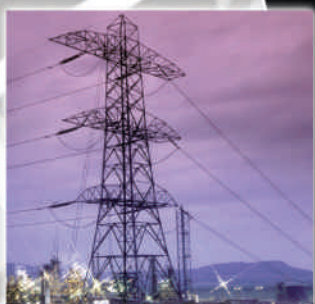


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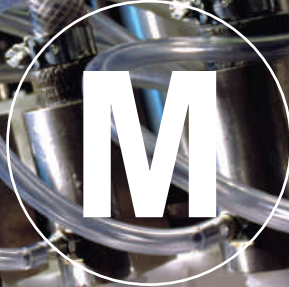
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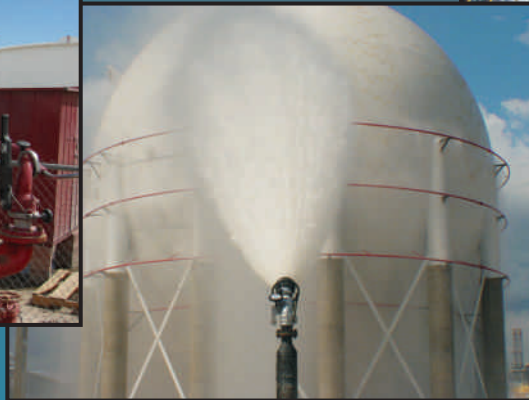


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September 2007 Issue 23



Front Cover Picture: South Korean rescue workers check the subway train destroyed by a fire at a subway station in Taegu, about 320 km (200 miles) southeast of Seoul, February 18, 2003. A South Korean fire rescue official said that there were about 100 more bodies in a burned subway car after a suspected arson attack on an underground train in the South Korean city of Taegu. Picture courtesy of REUTERS/Kim Kyung-Hoon KKH/FA

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Contents

05 NFPA Foreword

**07-16 News,
Product Profiles,
Reviews & Viewpoints**

**19-21 Gaseous
Suppression Systems
and The Environmental
Challenge**



19-21

**23-26 The
Evolution of the Foam
Top Pourer**



23-26

**29-32 The Future of
Thermal Imaging
Technology**

**35-38 New
Technology SCBA - A
Giant Step Forward**



35-38

**41-44 Don't Learn
by Accident: The
Importance of Training**

**47-51 Hydraulic
Rams Versus Lifting
Bags**

**53-58 New Fire
Protection Technology
for LNG Hazards**



47-51



53-58

**61-65 Mass Decon
Techniques and
Concerns**

**67-70 Fixed
Installation Firewater
Pump Packages**

**72-79 Distributor &
Representative Office
Listing**

80 Advertisers' Index



61-65



67-70



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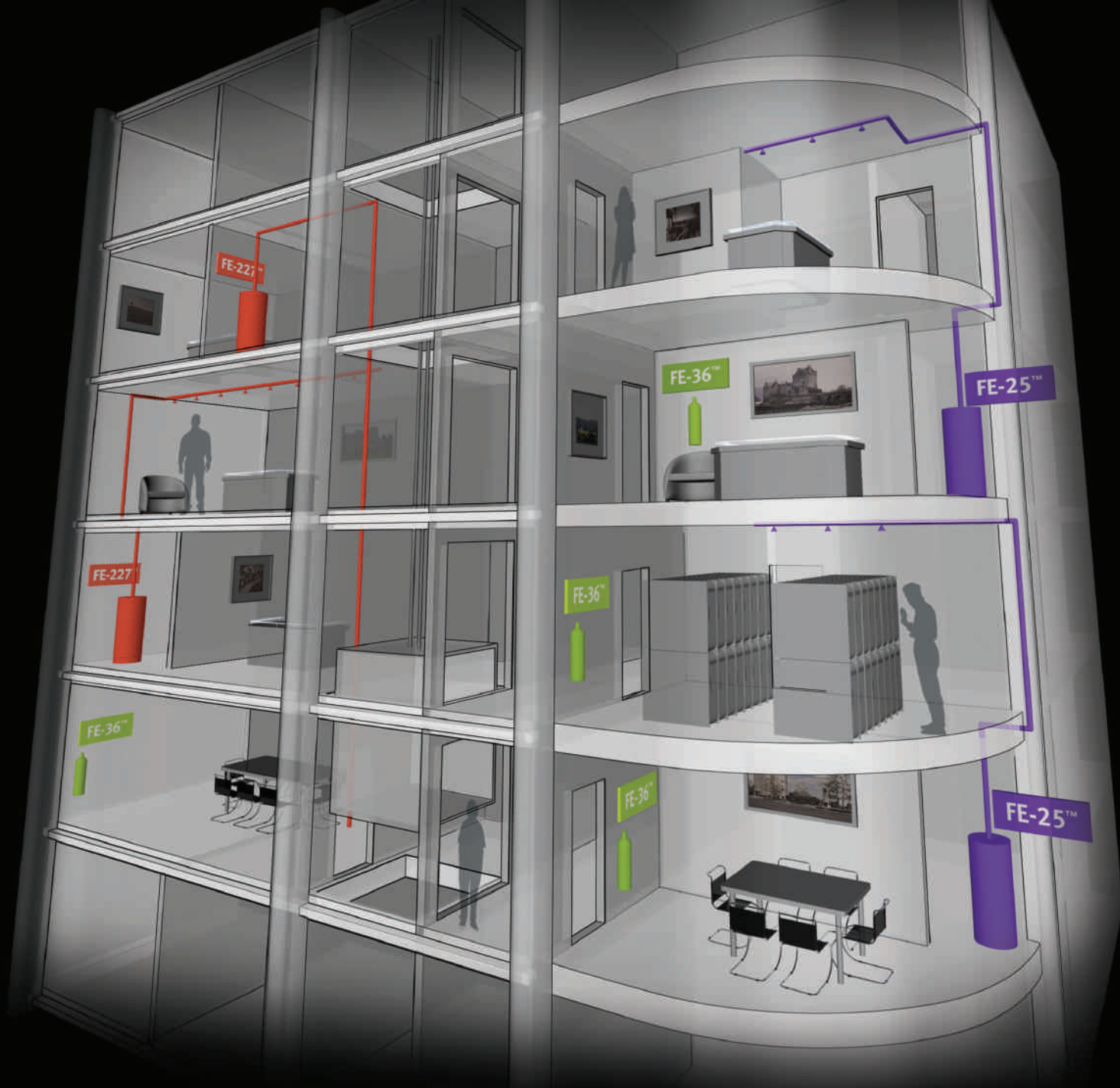
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Foreword

NFPA code training

By Olga Caledonia

Executive Director
International
Operations, NFPA

As I travel around the world, the question I get asked the most is, how can I get access to NFPA code training? Surprisingly, the answer is very simple, NFPA's Online seminars!

Modern communication technology, especially the Internet, has made it possible for information to be brought forth from any country and disseminated almost instantly all over the globe. Most importantly, it offers the promise of greater advances than ever before in the development and application of technologies and practices that save lives and protect property.

NFPA began offering online learning programs in early 2003 and to date over 12,000 industry professionals have registered for various programs. We offer four certificate programs: Fire Alarm Fundamentals, Automatic Sprinkler Systems, Electrical Installations in Hazardous Locations, and Fire and Life Safety in Health Care Occupancies. These four major programs segment into various individual modules. Participants can take any or all of these programs to suit their learning needs. For example, the Automatic Sprinkler System Certificate Courses include modules such as: Sprinkler design, Deluge and Pre-action systems, Dry-Pipe Systems and Sprinkler components to name a few. Each segment can be learned individually. Also, we offer additional online programs in Flammable Liquids (three modules), Fire Extinguishers at Work, and Terrorist Awareness for First Responders. A complete description and listing of the programs can be found at www.nfpawbt.org.

Learners can sign up for one or more programs and have up to 90 days to complete them so it is a great way to learn at your own pace. Throughout each program, learners are challenged to check their

knowledge and understanding of the information. Since *Online Learning* is self-paced and internet accessible, learners can work with it just about anywhere they have a computer and connectivity. For this reason, remote technical professionals, overseas and international individuals, and others who are time-limited can also get the advanced technical training they need to advance their professional capability and their careers. We recently received feedback from an online subscriber from Karachi, Pakistan who signed up for the Fire and Life Safety in Healthcare Occupancies certificate program noting the importance of the course as he continues to build a career as a hospital safety officer.

There is tremendous commitment from the people in our industry. Despite the diversity of people around the world, I realized what a small world we have become. NFPA receives weekly inquiries from people across the globe: from the Americas and Caribbean, to the Middle East and throughout Asia. Many of these questions are regarding how our online learning works, which programs are right for them, how do they can access the content, and a variety of other matters. What surprises all online learning customers is the speed and detail of the answers they receive. NFPA makes it a point that no matter where in the world they live, they get a prompt and welcoming response. To us, that is simple professional courtesy and what our members and customers rightfully expect. We are honored to be an internationally trusted learning partner.



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In order to find a region where there are no MAGIRUS turntable ladders, you have to search for a very long time. Around the globe, over 6,000 of our ladders are in service: on all continents, in urban centres and rural areas, both large and small fire brigades. World-wide, this number is without equal – and our most convincing reference. You want to know more? Any time, any place, with pleasure.



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The New PSS 7000 – Revolutionary Breathing Apparatus from Draeger Safety



Forming part of a revolutionary, complete system solution from DRAEGER SAFETY, the new Draeger PSS 7000 Breathing Apparatus (BA) has been specifically designed with the needs of firefighters in mind. Developed by professionals for use in even the most hostile of environments, this innovative set boasts advanced technology as well as a modular design. Enabling the set to be easily and quickly configured to suit different operational requirements, it also provides seamless integration with facemasks, head protection and communications equipment.

Easily upgraded to meet future needs, the Draeger PSS 7000 is the latest development in Draeger's ongoing commitment to the provision of world class breathing apparatus and incorporates tried and tested pneumatics as well as the most advanced materials. Bringing greater confidence to users by combining the very best ergonomics with reliability, durability and safety, it also offers easy care and maintenance. In addition, the Draeger PSS 7000 combines a wide range of features to maximise comfort and minimise both stress and fatigue, and is ideal for use with personal monitoring and/or telemetry systems.

The new harness, for example, features advanced compression moulded comfortable padding that combines high temperature performance with exceptional wear resistance. A high grip, anti-slip surface ensures that the harness stays in position and the set remains secure on the body, whilst a quick release mechanism on both the waistbelt and shoulder harness allows quick and easy detachment for easy

cleaning and maintenance.

Adjustable and robust, the new heavy duty stainless steel strap buckles ensure long life and easy operation when donning

and doffing, and the shoulder pads and waistbelt both feature a new quick release mechanism for easy maintenance. As an added benefit, the new hose sleeves on the shoulder harness are covered with reflective material to increase visibility and, at the same time, provide additional hose protection and minimise the risk of snagging.

Also featuring 3-point height adjustment, the lightweight, high strength carbon composite back plate incorporates further integral hose channels to eliminate snagging and offer improved protection. Large carrying handles have also been integrated for better handling and safety, and a new slide and swivel waistbelt mechanism ensures correct positioning on the body during donning. The first stage pressure reducer has also been fitted with a quick release mechanism for easy maintenance.

For more information, please contact:
Draeger Safety Asia Pte Ltd.
Tel: +65 6773 9288
Email: dsa.singapore@draeger.com

Elkhart Brass Expands Unibody Electric Valve Warranty

New Industry Leading 10-year Controller, Motor and Valve Warranty

ELKHART BRASS continues to lead the category in innovations with the announcement they are expanding the existing 10-year valve warranty to include the controller and the electric motor.

"The improvements we have made in research, design, manufacturing and testing over the last few years have lead to building the highest quality waterflow systems in the industry. These improvements drove this new, expanded warranty and prove the confidence we have in our Unibody Electric Valve product," stated Don Sjolin, Marketing Director for Elkhart Brass.

The 10-year warranty now covers all valve related electric components, including the controller, the motor, and the sensor(s). The warranty is the most comprehensive and longest warranty on electric waterflow components in the industry.

"We are on a mission to increase acceptance of electric valves in the industry. The new Unibody Electric Valve system provides critical pressure and flow data in the cab and/or at the pump panel. More accurate control and knowledge of waterflow improves safety. This



warranty is just one of the ways we are helping to change current electric valve perceptions with the ultimate goal of improving firefighter safety," stated Don Sjolin.

The new warranty takes effect immediately on the Unibody Electric Valve system.

For more information, please contact:
Elkhart Brass, Inc.
Email: dsjolin@elkhartbrass.com
Website: www.elkhartbrass.com

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About Conference & Exhibition Management Services (CEMS)

Since its establishment in 1980, CEMS has been a regional organiser with global perspective. It is a key player in the Meeting, Incentive, Convention and Exhibition (MICE) industry, with a vast knowledge and experience in organising and managing exhibitions, conferences and special events for government agencies, associations and private enterprises. With its business activities span in many countries in ASEAN region, China, India and Pakistan, CEMS' portfolio of exhibitions includes the Apparel Asia, Yafa Asia, Enviro Asia, The Singapore International Jewelry Show and Beijing International Tourism Expo. CEMS was the first professional conference and exhibition organiser to obtain the ISO 9002 certification in October 1997. In all, CEMS has been involved in more than 200 major conventions and exhibitions since 1977. For more information on CEMS, please visit www.cems.com.sg

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From the 31st of October to 2nd November 2007, leading event organizer, Conference & Management Exhibition Services (CEMS) will be holding the 9th Safety & Security Asia 2007 (SSA) at the Suntec Singapore International Convention & Exhibition Centre.

The main event for security professionals this year will also incorporate the 7th Fire & Rescue Asia 2007 (FRA) and the 2nd Homeland Security Asia 2007 (HSA). These exhibitions will feature breakthroughs in advanced technological safety & security equipment and devices, intelligent systems, fire prevention management and products.

SSA, held once every two years for the last 18 years, has been positioned as a hub for regional security professionals and has attracted thousands of visitors more than half of which comes from regional countries like Malaysia, Indonesia, Thailand, Vietnam and Philippines.

A series of other events, conference and seminars will be held concurrently during the exhibitions, such as the Asia Security Conference 2007, Security Technologies and Security Industry Focus Seminars. CISCO's influential presence as a co-organiser for the conference, will also see them adding on several prominent security personalities from around the world.

Associate Professor Ho Peng Kee, Senior Minister of State, Ministry of Law & Ministry of Home Affairs, will be the Guest-Of-Honour at the conference official opening.

Notable speakers representing various industries will come together to discuss topics that cover all aspects of security and its challenges in the present environment. Speakers line-up includes Dr. Rohan Gunaratna, Head of International Centre for Political Violence & Terrorism Research (ICPVTR) S. Rajaratnam School of International Studies (RSIS), Nanyang Technological University (NTU); DAC Anselm Lopez, Director of Security Industry Regulatory Department (SIRD) in Singapore Police Force; Mr. Bill Chua, the Executive Vice President and Global Head for Delivery Channels and Operations of United Overseas Banking Group; Mr.

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For more information about the show, please contact:
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Mr. Derick Ding
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Tel: (65) 6278 8666
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www.firerescueasia.com.sg

Christian Sommade, Executive Director of European Homeland Security Association (France); Mr. Tan Tong Hai, President & Chief Executive Officer of Singapore Computer Systems (SCS) and Mr. Wallace Gowin, the Regional Security Director Asia Pacific of Agility.

This year, the organiser is projecting more than 300 exhibitors representing more than 30 countries. As a sign of increasing global concerns, CEMS is also expecting a 60% increase in visitorship made up of mostly regional safety & security managers and consultants, properties & facilities managers, developers, architects and trade professionals.

Associate Professor Ho Peng Kee, Senior Minister of State, Ministry of Law & Ministry of Home Affairs, will be the Guest-Of-Honour at the conference official opening.

For more information, log on to www.safetysecurityasia.com.sg

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Easy Decon by Professional Protection Systems

One of the latest developments in decontamination is a foam product designed for use on buildings or vehicles. Developed in the US this product known as EasyDECON™DF200 and is capable of killing or neutralising a broad range of WMD contaminants. Also because of its unique chemical structure it can be used on practically anything. The product is particularly suitable for the decontamination of structures as it has the unique ability to adhere to vertical and inverted surfaces where it creates a foam blanket to maintain the required contact time between agent and decontamination formulation. EasyDECON™DF200 has the added virtue of being non-corrosive and its use adds no environmental load to the appropriate clean-up operation. Kill time ranges from a few minutes to half an hour depending on environment and prevailing conditions.

When used with dedicated application equipment even coverage is achieved, maximising contact time and suppressing any reaction from the agent being treated whilst decontamination takes place.

The most obvious major feature of this new system being is that it does not use water. Water has been at the central element in all decontamination



technologies until now. Essentially what water does is to move contaminant from one place to another. If its protective clothing or human casualties you are decontaminating the subjects, and the arena of operations are small enough for contaminated water to be contained somewhere and disposed of. But with a vehicle you start to have problems and with a building it becomes just about impossible to use successfully. This product is the answer.

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Website: www.ppsgb.com

Nittan evolution control panel range extended

Leading conventional and addressable fire detection manufacturer NITTAN (UK) Ltd. is pleased to announce the launch of new control panels for its Evolution range of fire detection products.

The new range of Evolution protocol addressable control panels have been manufactured by Advanced Electronics – one of the most popular brands in the UK.

The Advanced panels consist of a simple to use LCD menu driven GUI, dual, flash based microprocessor technology driven by an on-board power supply and charger approved to EN54 parts 2 and 4. The panels are fully expandable from one to two or four loops, depending on the model, and come complete with on-board sounder circuits.

They are suitable for use in a wide range of sites, small to large, simple to complex.

Extremely easy to install and use due to the dedicated system navigation keys and uncomplicated commissioning and fault finding, the new Advanced panels can also be accessed remotely via a low cost modem connection for quick and convenient diagnostics.

Nittan is expecting these panels to have a major impact when combined with the Evolution Range of detectors.

For more information, please contact:
Nittan
Email: sales@nittan.co.uk
Website: www.nittan.co.uk

Holmatro® CORE™ Technology

Turning point in speed, ease and safety for working with hydraulic rescue equipment

Until its introduction in June 2005 hydraulic rescue tools always consisted of a pigtail (dual) hose system, with a separate pressure and return hose connecting pump and rescue tool. A CORE™ system consists of only one hose: a high-pressure inner hose inside a low-pressure outer hose. The hydraulic principle and tool performance of CORE™ Technology and traditional technology are of course identical. CORE™ Technology ranks with the most important innovations in the field of extrication ever. The benefits for the user of a system which can be summarized as follows: "quick, easy and safe".



Quick

A CORE™ system allows the rescuer to change (disconnect and connect) the tool on the spot, while the hose is under flow and without having to switch the valve back at the pump. CORE™ couplers can rotate (360°) freely on both ends. Therefore it is now possible for instance to unroll a hose while walking away with a connected tool and start opening the tool in the meantime. These CORE™ Technology features result in significant time savings.

Easy

A CORE™ hose has fewer autolock couplers than a pigtail hose and it gets coupled directly at the tool. This allows you to couple the tool in any position, even when holding the tool in one hand and clicking the hose on with the other hand. The possibility of changing tools while the hose is under flow makes changing over at the pump unnecessary. This results in increased flexibility: with CORE™ Technology a complete rescue set can be operated easy and efficient by just one rescuer.

Safe

Because the high-pressure hose is integrated within the low-pressure hose, it is never in direct contact with the outside environment. These and other safety measures make sure that the user is never exposed to more than 25 bar. CORE™ hoses are reinforced with state-of-the-art multi-layered aramid. Even the most rigorous and prolonged test scenarios have not resulted in any kinking or possible damage resulting from it.

For more information please visit our website: www.holmatro.com

New SCBA Launch:

Atlantair by Avon Protection Systems

Avon Protection Systems, part of Avon Rubber p.l.c., is acknowledged as a world leading provider of advanced Chemical, Biological, Radiological and Nuclear (CBRN) respiratory protection solutions.



An extensive range of products from complete CBRN capable Self Contained Breathing Apparatus (SCBA) systems to compact single use escape hoods is supplied to an array of customers across the world including; fire-fighters, military, law enforcement professionals, emergency medical professionals, key utility and transportation workers and people at risk anywhere.

Avon Protection Systems has a unique capability in CBRN protection based on a range of advanced technologies in respirator design, filtration and compressed air breathing apparatus. This enables Avon to develop specialized solutions that take full account of user requirements.

The CE Atlantair™ range of Self Contained Breathing Apparatus (SCBA) is Avon Protection System's most recent development offering true operational flexibility for fire-fighting and HAZMAT units. Atlantair™ also meets the growing demand for an SCBA capability from specialist and paramilitary forces, explosive ordnance disposal (EOD) units, as well as naval and air force fire fighting units.

Developed by the team at Avon – ISI, the range incorporates all the latest innovations originally presented in the ISI Viking Series of NFPA compliant systems. ISI was first to market with many features now taken for granted by SCBA users. The Atlantair™ range marks Avon's entry into the SCBA market outside the USA, where it has a leading position in SCBA technology through Avon-ISI. Atlantair™ offers a broad capability in respiratory protection, giving users exceptional operational flexibility when dealing with extreme CBRN threats.

Atlantair™ meets the latest EN137:2006 class 2 standards including the new high temperature flame engulfment test. In addition the system also meets the BS8468-1 standard for CBRN SCBA.

Atlantair™ integrates a wide range of standard features in an ergonomically designed system, which includes a head up display (HUD) and hands free, integrated voice and activated radio communications. The systems come with a choice of 3 sizes of high comfort masks offering wide vision. Butyl mask options offer a fully CBRN compliant system with silicone mask options providing enhanced comfort. The mask features a double curved, anti-fog and anti-scratch lens for excellent field of view.

The Atlantair SCBA range has the world's smallest, lowest profile Demand Valve. It either offers integrated bypass and first breath activation or an optional AirSwitch® mask capability to allow instant access to breathing air from a ready state. The integrated HUD allows the user to monitor alarm conditions as well as the status of the cylinder.



Atlantair™ offers optional integrated hands free voice communications and head up display all of which are ATEX compliant for Intrinsic Safety. In addition the system comes complete with easily adjustable voice activation volume to eliminate breathing noise without impacting communications.

The system incorporates an easy – to – use control console which houses the complete electronics package, including head up display (HUD) processing, Radio Communications, VAS and PASS motion sensor.

Atlantair™ comes with a choice of ergonomically designed harness and backplate configurations for maximum comfort and adjustability. The integrated design approach results in a clean, low profile system. It provides users with a choice of lightweight carbon cylinders pressurised to 200 or 300 bar with 30, 45 or 60 minute durations. A range of options are also available including buddy breather, cylinder fast fill connection, airline connection, and wireless personal alert system. The product is easy to maintain, delivering low ownership costs.

Another example of Avon's innovative approach to personal respiratory protection is the revolutionary EH20 hood. A highly protective personal emergency respirator, EH20 is a compact and portable device offering effective short term protection from chemicals, CBRN agents and toxic particles. Offering a safe solution to emergency responders who may not have immediate access to SCBA or other devices, it is fully CE certified.

Be one of the first to witness the launch of Atlantair at A & A Dusseldorf stand 5B34.

APF

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protection@avon-rubber.com

Website:

www.avon-protection.com

Join the elite



ISG THERMAL SYSTEMS, one of the world's leading thermal imaging camera manufacturers, proudly announces the launch of their revolutionary new camera The Talisman K-1000.

The K-1000 utilises Megapicture technology which is a system developed by ISG exclusively for their fire fighting cameras. This means that picture quality is more enhanced giving the fire fighter a better viewing image. Not only does this technology improve picture quality but it also improves "headroom" which is the highest temperature the camera can clearly image which obviously improves fire fighter safety. The K-1000 is truly a first, for example, it can successfully image ceiling temperatures up to 1000°C which up until now was unheard of.

The big secret to the Megapicture technology is the K-1000's High resolution sensor. The sensor has 76,800 imaging pixels. Think of it if you will like a digital camera or camcorder, the more pixels, the better the image quality. Coupled to this system is the K-1000's ability for fast update rates. In a situation where there are constant heat changes in the environment, Megapicture technology scans 4,608,000 scene elements each second resulting in the user viewing not only a clearer image but also to make better and safer decisions.

The brains at ISG have really been working hard on the development of the K-1000 and another great feature about the camera is its oversized lens. Just like a normal everyday camera, the same rules apply to thermal imaging cameras, the bigger the lens the more scene elements

the camera can focus on. The K-1000's Megapicture system uses the biggest lens currently available and can sense 77% more data, coupled with the fast update rates the result is spectacular image clarity.

Tonny Hutting ISG's International training manager explains the idea behind the K-1000. "Fire fighters put themselves at risk every time they enter a building that is fully involved. They are at constant risk from ceiling collapse, the possibility of a flashover situation constantly changing temperatures and also not having the correct equipment that can give them the information they need. By assessing these problems and as a qualified fire fighter, the K-1000 is the logical choice". Unlike other units, the image does not saturate when the temperature gets too high. The K-1000 can clearly detect temperatures of 1000°C which from a fire fighters perspective, will tell him if a ceiling could possibly collapse or if a flashover situation could occur. The K-1000 is also extremely user friendly, the screen constantly displays such readings as battery power and temperature. On a full recharge which only takes about two and a half hours, you can expect the camera to function perfectly for at least five hours and from switching on, the camera is ready to use in less than five seconds it also comes complete with a hard carry case and neck strap".

For more information about the ISG Talisman K-1000 contact:
ISG Thermal Systems Ltd
Tel: +44 (0) 1268 527700
Web: www.isgfire.co.uk

Talisman K-1000 specifications include:

Electronics

Sensor Type: Vanadium Oxide Microbolometer
 Resolution: 320 x 240
 Spectral Response: 8-14 microns
 Dynamic Range: Over 1000°C in Thousand Plus Mode
 Mode switch time: 0.08 seconds
 Update rate: 4,608,000 scene elements per second
 Field of view: 59 degrees
 Nominal start up: Under 5 seconds

Temperature measurement

Measurement: FPA Centre Pixel Area

Measurement Range: Up to 1000°C
 Resolution: +/-1°C
 Repeatability: +/-1°C

Physical

Weight: Under 1.4kg
 Housing: Radel-R High Heat Thermoplastic
 Waterproofing: IP67 – immersion up to 1 meter
 Drop test: 2 meters

Power source

Operating time: Over 5 hours
 Low battery warning: Displayed on screen
 Recharge time: 2.5 hours

Bright future for new Wolf LED torch range

WOLF has introduced a new LED Primary Cell Torch range, Certified to ATEX and IECEx by Baseefa (2001).

The three torches in this TR-40 range incorporate high power LEDs, producing a flawless intense white beam of about half a metre diameter at five metres and a light source that is 'fitted for life'. Each torch is powered by four x AA alkaline primary cells, which will not only produce an optimum output for up to seven and a half hours duration, but will also continue to provide a good light for up to 72 hours.



The TR-40 LED Primary Cell Torches are approved for safe use in Zone 1 and 2 Hazardous Areas, Group IIC T4 Explosive gases, dusts and vapours. Weighing 360 grams including batteries, they are one of the lightest LED safety torches available. The TR-40+ version is fitted with a low battery indicator and a black TR-45 model is Certified for use in Zone 0 gas environments.

Ideal for maintenance and inspection tasks on industrial sites, fire-fighting, oil, gas, petrochemical, and offshore applications, the TR-40 range completes the Wolf Safety family of ATEX Torches, filling the gap between the hugely popular TR-24+ and the impressive R-50 LED rechargeable torch ranges.

For more information, please contact:
Wolf Safety Lamp
Email: info@wolf-safety.co.uk
Website: www.wolf-safety.co.uk

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PBI at A+A 2007 from Sep 18-21 in Düsseldorf in Hall 3 Stand D74



L&W – Leading Manufacturer in the Compressor Market

The German manufacturer L&W (Lenhardt & Wagner Kompressoren) has been expanding and beginning to network into the Asian market, by setting up an Asian sales and support office in Singapore. The Singapore operation will hold stock of units for sale and provide full support and supply of spares.

L&W manufactures a wide range of compressors suitable for small dive operations and liveaboards to larger self-contained models that feature built-in diesel generators suitable for remote use. Most models are also available in an **"SILENT"** option, which feature a sound insulated housing which reduces the noise level down to 62 dB(A). They also produce a range of Storage systems, filling panels as well as blending panels for nitrox and trimix.

Compressors are available up to 6000 liters per minute and up to 420 bar.



Fire truck with LW1300 and accessories

LW 100

This brand new model of L&W compressors Germany is latest state of art technology in High Pressure Breathing Air compressors.

The unit comes with a real 100 lit/min free air delivery and is available in 3 versions: Single phase, three phase and also Gasoline engine. L&W uses newest valves technology, steel piston rings and a new construction of the compressor block. With it newly developed cooling system The life time of the breathing air filter is nearly 50% higher than comparable models.

LW 280 EC

Breathing air and Industrial air applications. Stationary compressor fully equipped and suitable for continuous running applications. For the

LW 280 onwards all our compressors are equipped with oil and water separators after each stage for longer life time and lower maintenance costs of the compressor.

LW 280 ES – 280L/min; Electric; Silent

One of the quietest compressors in its class. It has been specially developed for modern day conditions: a medium capacity compressor, with an insulated housing, which provides excellent noise suppression @ 61dB(A).

The control panel provides space for up to 6 filling hoses and an overview of the essential compressor controls.

LW 570 Diesel & 450 E – 450 & 570L/min

For applications where large quantities of air are required without sufficient electrical power supply. The LW 450/570 D has a self contained 12V DC power supply providing electric start, idle and full speed selector, automatic idle and condensation drain when final pressure is reached. The diesel fuel tank provides 2 hours of continuous operation.

LW 570 E & ES – 570L/min; Electric or Diesel; Silent option

The 570 series are 4 stage piston compressors for large, professional applications. Able to deliver 570 liters/min and working pressures up to 420 bar if required.

The unit has been designed for the arduous demands of large filling stations such as large diving schools or hyperbaric facilities.

LW can offer for all compressors the matching NITROX MEMBRANE SYSTEMS up to 40% Nitrox.

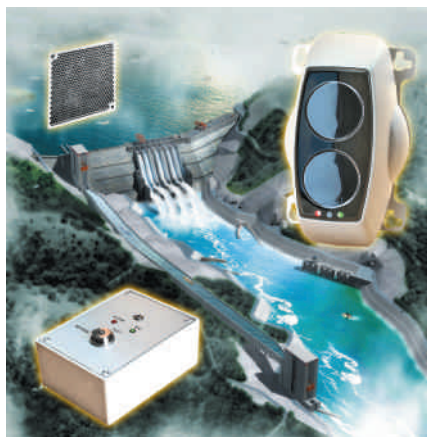
For more information, please visit us at www.lw.com.sg or call: +65-67321178

Longtan Hydropower Station Uses Beam Detection

One of the world's largest hydro-electric power stations, situated on the Hongshui River in the Guong-Xi province of China, the Longtan Hydropower Station will use 100 Fireray 100R reflective beam smoke detectors as part of the complete fire safety and detection system provided by Cooper Asia.

Due for completion in 2009 but already partially operational, the 216.5m high dam has had US\$3.75 billion invested in its construction and will be capable of an estimated maximum annual production of 18.7 billion kWh of electricity. It is the world's highest roller compacted concrete dam, and incorporates the world's fastest ship lift.

The Fireray 100R reflective beam smoke detector from Fire Fighting Enterprises houses the transmitter and receiver in the same unit, with the infrared light being bounced back by a small prismatic plate on the opposite wall. This allows the coverage of a wide area by relatively few units, reducing the disruptions and costs of both installation and cabling. As a part of the fire safety system, these devices will cover large areas which would otherwise have required the installation of numerous 'point' detectors – as many as 16 per unit



– to safely monitor the 1500m² that each 100R is effective over. Details on the full range of smoke detectors from FFE can be found on their website (www.ffek.com), including information on the new Fireray 5000 with optical alignment and motorised beam auto-optimisation features.

For more information, please contact:
Fire Fighting Enterprises
Tel: +44 845 4024 242
Website: www.ffek.com

SAPPHIRE® – sustainable, environmentally acceptable fire suppression technology

According to Tyco Safety Products, Fire Suppression Group, its SAPPHIRE® fire suppression system for protecting business-critical assets ended the search for a truly sustainable, environmentally acceptable and long-term clean agent alternative to the now outlawed Halon 1301.

SAPPHIRE is a high-performance fluid-based fire extinguishing system that uses 3M™ Novec™ 1230 Fire Protection Fluid; long-term technology that not only satisfies today's regulations, it also meets all of those in the foreseeable future. It has several advantages over other extinguishing agents on the market. SAPPHIRE has a negligible impact on the environment, with an insignificant global warming potential, lower than any of the halocarbon agents acceptable for use in occupied spaces.

It is designed to protect essential and delicate telecommunications and data processing equipment. It also has applications within the cultural heritage sector protecting artefacts that would otherwise be destroyed by water from traditional sprinkler systems. The innovative suppression technology is also making major inroads in the on-shore and off-shore oil and gas industries; in the power generation sector; and for more specialist applications such as protecting engine test cells, and within the vehicle manufacturing industry generally. SAPPHIRE is also widely used to protect ships' engine rooms and compartments and has been installed successfully in hundreds of boats and ships.

Installations around the world have shown SAPPHIRE to have an acceptable footprint, the lowest level of design concentration and the highest safety margin of any viable Halon 1301 or chemical alternative. The agent also has impressive environmental credentials with zero ozone depleting potential and a remarkably low atmospheric lifetime of just five days, compared with 107 years for Halon 1301. SAPPHIRE has a global warming potential of just "one", which means that 11,900 kilograms of the Novec 1230 fluid would have to be released to have the same impact on climate change as just one kilogramme of a typical

alternative HFC or hydrofluorocarbon.

SAPPHIRE'S fluid is stored in containers as a low vapour pressure fluid that, when discharged, transmutes into a colourless and odourless gas. Unlike other fluid fire extinguishing agents, it can be used with absolute confidence to suppress fires involving electronic, computing or communications equipment. Typical total flooding applications use between 4.6% and 5.9% concentration by volume of the fluid for land-based applications and, typically, a 5.5% concentration for marine applications. This is well below the agent's saturation or condensation level. After discharge, the agent is dispersed through natural ventilation, leaving no residue to damage sensitive electronic equipment; it is also non-conductive and non-corrosive.

While certain HFCs and inert gases are used at design concentrations that are below the NOAEL or No Observed Adverse Effect Level, with safety margins from 7%, no other Halon alternative comes anywhere close to the SAPPHIRE safety margin.

SAPPHIRE has amassed a host of international approvals including LPCB (Loss Prevention Certification Board), FM (Factory Mutual) and UL (Underwriters Laboratories) listing. Marine approvals include MCA (Maritime & Coastguard Agency); Germanischer Lloyd; DNV (Det Norske Veritas); BV (Bureau Veritas); ABS (American Bureau of Shipping); LRS (Lloyds Register of Shipping) and MED (Marine Equipment Directive). It also complies with SOLAS (Safety of Life At Sea), having successfully completed MSC (Maritime Safety Committee) 848 testing. Its credentials for marine applications have been further endorsed by its recent winning of the prestigious Seatrade Awards 2007 Safety at Sea Award, sponsored by Lloyd's Register.

APF

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Two fatal fires in karaoke clubs in 2007



By J. C. Jones

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Karaoke as a form of entertainment originated in Japan in the 1970s. The first public karaoke performance was in Kobe, capital of the Hyogo Prefecture. By the end of the 1980s karaoke had become popular in many parts of the world, karaoke venues in the form of 'karaoke clubs', 'karaoke bars', 'karaoke parlours' and 'karaoke shops' having consequently proliferated.

In January 2007 there was a fire at a karaoke shop in Takarazuka, also in the Hyogo Prefecture, in which three teenagers died. At the karaoke shop, which was on the second floor of the building of which it was a part, food and drink were on sale to those participating in the entertainment. The fire began at a frying pan containing cooking oil. The female employee using it is alleged not to have paid sufficient attention and was arrested on a charge of professional negligence. In the community debate on the matter, some of which found its way on to the Web,¹ points outlined in the following paragraph were made.

The victims were youngsters with almost all of their adult lives in front of them, and this intensifies the sense of tragedy. According to a local newspaper the karaoke shop was a crudely converted warehouse lacking fire safety features. To what extent must the owner of the club take moral and legal responsibility? The Tokyo Fire Department in a comment on the accident in Takarazuka stated that 60% of karaoke venues in Japan are legally sub-standard in fire safety terms.

Much more grave still was the explosion at a karaoke club at Tianshifu in the Liaoning province of China in July 2007. The death toll stands at 25 and there were 33 serious injuries. Again the victims were young people, many of them seeking recreation at the end of the school examination period. This piece is being written less than a month later and no cause of the explosion has been given. It is however clear from pictures of the building after the accident (available on the Internet) that there was a significant overpressure. In fact not only the karaoke club where the accident originated but also neighbouring buildings were affected by the blast. What conjectures can we advance to account for these observations? The most obvious one is that LPG used for cooking was stored on the premises and that sudden loss of containment of this followed by ignition led to a fireball which, if confined by walls, would have displayed significant overpressure. From pictures of the scene previously referred to, an experienced fire investigator would conclude that overpressures had been of the order of 0.1 bar. A hydrocarbon explosion, especially if confined, can cause overpressures of this magnitude which are sufficient not only for structural damage to buildings but also for fatal injuries to

persons. With what paucity of information there currently is in relation to the explosion at the Karaoke centre in Liaoning we can cautiously suggest that overpressure rather than heat was the lethal factor. This is consistent not only with the observation stated previously that neighbouring buildings were affected but also with the tragic fact that a passing motorist and a passing motorcyclist were amongst the dead. That a hydrocarbon explosion can by reason of its overpressure overturn a vehicle weighing a ton or more is well documented.

In summing up, the fire in the Japanese Karaoke facility had an obvious cause, though questions in relation to conformity of the building to fire safety practices and in relation to legal responsibility remain. In the case of the karaoke

With what paucity of information there currently is in relation to the explosion at the Karaoke centre in Liaoning we can cautiously suggest that overpressure rather than heat was the lethal factor.

fire in China we do not even know what ignitable substance caused it, but there is strong evidence from accounts of the incident that the destructive factor was overpressure. LPG leakage has been suggested, but an explosion involving natural gas or fuel gas manufactured from coal could have produced the same degree of overpressure.

A social factor will conclude this article. Very many residents of the Japanese capital Tokyo live in small apartments and do not want to spend too much of their leisure time in them. There is accordingly a significant proportion of residents, as opposed to visitors, amongst the participants in Tokyo's night life. Such residents are imperilled when thus seeking diversions locally if fire safety at facilities like karaoke bars is sub-standard. **APF**

Reference

1. <http://www.japantoday.com/jp/news/396716/all>

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Gaseous Suppression Systems and The Environmental Challenge

By John Allen

EMEA Marketing
Director, Tyco Safety
Products, Fire
Suppression Group

With businesses survival becoming ever more dependant on the performance of critical assets, their protection from fire remains high on the corporate agenda. So says John Allen, EMEA Marketing Director for Tyco Safety Products, Fire Suppression Group. Here he looks at the different types of gaseous suppression systems on the market and assesses the way in which the need for effective fire safety is balanced against environmental concerns.

Business continuity, crisis management and disaster recovery planning are terms with which we are all becoming increasingly familiar. At any one time, there seems to be a major conference taking place somewhere around the world addressing one key issue – how to ensure that the business survives a major disaster.

While this has always been a concern for businesses, their increasing dependency on communication and computer technology has shifted the fire protection attention away from assets generally. Today the concern is very definitely focused on safeguarding those assets that have the potential to debilitate or possibly destroy the business if they fall victim to fire.

Just about every type of business is affected. Banks and other financial institutions face a total inability to conduct financial transactions; call centres, upon which many insurance, travel and retail businesses now depend, risk being put out of operation; and offshore oil and gas platforms are confronted with the prospect of \$millions in lost revenue for every day a production platform is out of commission. Merchant shipping safety is jeopardised if fire breaks out in an engine compartment or control room; even a country's defence is compromised if a strategic command centre is damaged or destroyed by fire.

However, this increasing dependence on IT infrastructures and the need to protect computer



suites, telecommunications centres, data storage facilities and control centres has occurred at a time when society has placed unprecedented importance on protecting the global environment. So, while the now banned Halon 1301 proved to be extremely effective as a firefighting agent, environmental concerns were enough to consign it to the firefighting history books. It was followed by a number of other suppressants that ultimately also failed to win over the environmental lobby.

Several factors need to be considered when selecting the most appropriate suppression system. These include the nature of the asset that is being protected; whether the location is occupied; and what space is available for suppressant storage. Increasingly nowadays, the company's policy regarding environmental issues also has to be added, as does its attitude to long-term sustainability. The overall picture though is that the market now demands reliable, genuinely sustainable, environmentally acceptable and long-term fire suppression solutions.

Essentially, there are three gaseous fire suppression options that warrant consideration: inert gas systems; chemical suppression systems; and CO₂.

The inert gas option

The scientists' initial response to the need for alternatives to ozone-depleting agents resulted in the unveiling of a number of often, as it transpired, prematurely heralded options. These Halocarbon alternatives comprised Halon-like compounds. Some proved effective and were adopted by the fire industry and building occupiers, while others failed due to their inefficiency or toxicity.

Against this scenario, inert gas suppression has grown in popularity, as it answers the global warming challenge. Inert gas systems have precisely the environmental credentials that the market is seeking: zero ozone depletion potential, zero atmospheric lifetime, and zero global warming potential. They are also a truly sustainable "clean"

fire suppression technology. Inert gases are non-toxic, they will not harm sensitive electronic equipment, art treasures or documents, and are safe to use in enclosed areas where people may be working.

While some inert gas systems use a single naturally occurring gas, most are a non-conductive and non-corrosive blend of naturally occurring gases, such as a combination of Nitrogen and Argon. They have a similar density to air, so the protected space retains its concentration far longer than was the case with the now-banned Halon 1301. Inert gases work by lowering the oxygen content of the protected area to a point that will not support combustion, but is sufficient to sustain human life. Their appeal for use in occupied spaces is further enhanced, as the gases are invisible and so do not obscure vision, which might otherwise make panic more likely among the room occupants.

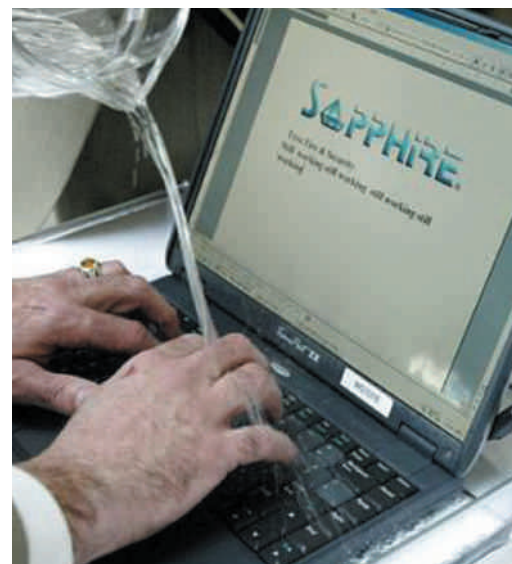
However, their downside is that inert gas systems do demand substantially more space to store the suppressant. An inert gas installation typically takes up to seven times the space of a comparable Halon 1301 installation.

But, to organisations specifying that a non-chemical suppressant is of overriding importance, inert gas systems are an attractive option. Nevertheless, there is clearly also a strong desire in the market for an acceptable chemical fire extinguishing agent; one that combines the advantages of the early Halon-like alternatives with the environmental profile of the inert gas systems.

The chemical system solution

An inevitable consequence of the signing of the Montreal Protocol was that Halon installations around the world had to be replaced with alternative systems, and the desire for long-term sustainability became a key driver.

At the heart of this issue is the Kyoto Protocol (or to give it its full title, the Kyoto Protocol to the United Nations Framework Convention on Climate Change) that has, as its goal, the reduction of greenhouse gas emissions, preventing dangerous anthropogenic – man-made – interference with the climate system. It is targeting a basket of six gases: carbon dioxide, methane and nitrous oxide, along with three long-life industrial gases:



Hydrofluorocarbons – more popularly known as HFCs – Perfluorocarbons and Sulphur Hexafluoride.

Hydrofluorocarbons were initially considered to be an acceptable option following the Halon phase-out but, in addition to now being listed in the Kyoto Protocol's basket of undesirable gases, they all have global warming potential. Certainly they do not have the "clean" credentials of the latest generation of chemical suppression agents. HFCs though certainly assisted the Halon phase-out programme and helped in the transition away from ozone-depleting substances.

One way in which this need for environmental acceptability has been met is with the introduction of a fluid-based system that uses sustainable, long-term technology that not only meets today's legislative requirements, it also meets all of those in the foreseeable future. It utilises new technology and has several major advantages over other Halon alternatives.

It is a high performance fire-extinguishing agent that has a negligible impact on the environment and is designed to protect essential and delicate telecommunications and data processing equipment, plus it has applications within the cultural heritage sector protecting artefacts that would otherwise be destroyed by water from traditional sprinkler systems. It has an insignificant global warming potential, lower than any of the halocarbon agents acceptable for use in occupied spaces.

When discharged, it leaves nothing behind to damage sensitive electronic equipment or documents, and with no agent clean-up required, business critical installations can be back in operation in the shortest possible time. Similarly, priceless historic manuscripts do not have to be subjected to years of painstaking and expensive restoration work.

Carbon dioxide systems

Surprisingly perhaps, there are those that, mistakenly, question the use of CO₂ because of its connotation with global warming, the international desire to reduce CO₂ emissions, and its inclusion in the Kyoto Protocol's basket of gases. This misunderstands the difference between CO₂ that occurs naturally in the atmosphere, and the large quantities of undesirable CO₂ emitted as a by-product of many industrial processes.

The CO₂ used as a firefighting suppressant is extracted from a number of natural CO₂ producing processes, and is then stored until it is needed. So, its use in fire suppression systems actually results in a net removal of CO₂ from the environment. In any event, its use in fire protection is inconsequential when compared with the potential emissions damage caused by an uncontrolled fire, or the CO₂ belched-out by many industrial processes.

However, CO₂ is most certainly not suitable for total flooding applications in normally occupied rooms or enclosures, as its discharge in fire extinguishing concentrations would be lethal to room occupants. CO₂ does however continue to be a popular and versatile choice for total flooding of unoccupied enclosed areas. An essential consideration though is to ensure that the flooded areas are adequately ventilated after discharge of the CO₂ to prevent the accidental exposure of personnel to dangerous levels of CO₂ when



investigating the cause of the discharge. Because it is one-and-a-half times heavier than air, CO₂ tends to collect at low level and in under-floor ducts.

One particularly attractive feature of CO₂ is that it can be compressed into a liquid state which, when maintained under pressure, requires a smaller storage footprint than many other gaseous suppression agents. This can be of particular importance to city-centre-based organisations, where high rental costs mean that available floor space is frequently limited. Additionally, as CO₂ has so many other commercial uses, refills are readily available throughout the world.

The new suppression paradigm

The contribution made by the discharge of environmentally damaging gaseous fire suppression systems, is dismissed by some as being inconsequential. After all, they argue, they are primarily used to protect business critical assets and are believed to account for little more than three percent of the market. While this may well be true, the move to ban or at least penalise the use of environmentally unacceptable agents – perhaps through taxation – is unlikely to subside.

Additionally, following the demise of Halon 1301 and the forced decommissioning of Halon suppression systems, the business community is focused on adopting sustainable solutions. Such solutions are also rightly seen as perhaps the only way of more effectively managing the world's resources and reducing waste.

APF

John Allen is EMEA Marketing Director for Tyco Safety Products, Fire Suppression Group. He can be contacted by telephone on +44 (0) 1493 417600, by fax on +44 (0) 1493 417700, or via email at tspmarketing.emea@tycoint.com

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Pic courtesy of Angus Fire



The Evolution of the Foam Top Pourer



By Michael Mills

Angus Fire

As flammable liquid storage tank fires continue to make spectacular headlines around the world, the latest foam top pourer technology is enabling tank farm operators to “unspectacularly” nip them in the bud!

Installed on the side walls of fixed-roof (cone) and covered (internal) floating roof storage tanks, Top Pourer Sets (TPS) or Foam Chambers are designed to cover flammable hydrocarbon or water miscible liquids with low expansion foam for fire extinguishment or vapour suppression. They have the advantage over ground-based monitors of directing all their foam directly onto the flammable liquid surface regardless of weather conditions.

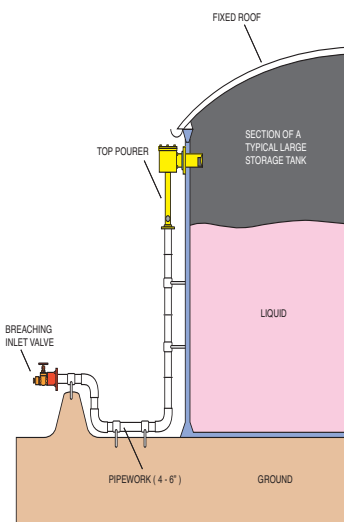
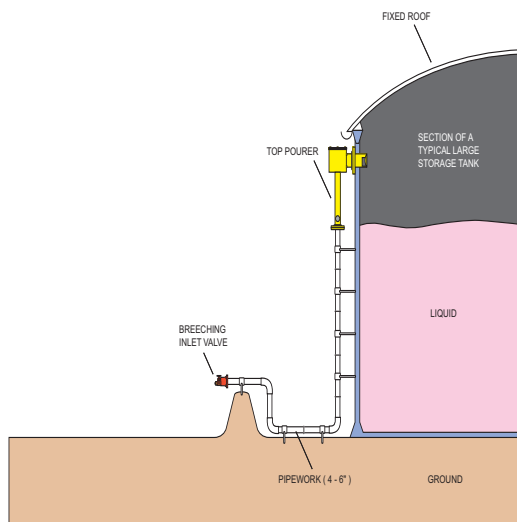
The first TPS was developed over thirty years ago, comprising a foam generator, vapour seal box and foam pourer. The foam generator made foam by introducing air into a foam solution stream that was delivered to the TPS in a variety of ways. Foam solution piping coupled to the unit was linked to a fixed foam proportioning system, or terminated a safe distance from the tank where it was linked to mobile foam proportioning equipment. The inlet of the TPS was fitted with a venturi jet designed to draw air into the foam solution stream through a series of holes located around the foam generator. Obstruction of the air inlet holes by nesting birds and insects was prevented on some models by a stainless steel screen.

The aerated foam then passed into a vapour seal box, which improved the quality of the foam and reduced its velocity prior to discharge on to the product surface. It was fitted with a frangible glass bursting disc or vapour seal located across the inlet to the discharge pipe. This prevented the escape of product vapours to the atmosphere. The flow of expanded foam ruptured the vapour seal at a pre-determined pressure, allowing the foam to enter the tank through a foam pourer.

Gently does it

The next generation of TPS was a less bulky and more cost-efficient design. It achieved this by adding to the vapour seal box a mechanical agitation mesh device or “improver” that was specially designed to produce top quality foam by optimising its expansion and drainage characteristics.

An even more important development was a new method of applying the foam on to the fuel surface. As the foam exited the pourer, it impacted a special deflector plate fitted to the outlet which directed the flow back against the inner tank shell wall in a butterfly-shaped dispersion pattern. This made the foam run down

Angus Fire TPS

the tank shell and flow gently on to the fuel surface, reducing the amount of foam submergence and fuel pick-up. This is an important consideration, especially with water miscible fuels. It also dispersed the foam to each side of the TPS for faster and more complete coverage. Applying the foam gently in this way is classified as Type II application by NFPA and Underwriters Laboratories as opposed to the forceful Type III application of ground-based foam monitors. It increases the effectiveness of the foam blanket, resulting in more efficient operation and superior extinguishing performance.

Maintenance matters

An early innovation in TPS design was warmly welcomed by safety maintenance engineers. A test cover was introduced at the rear of the unit, which for the first time enabled the unit to be tested without foam entering the storage tank. Nowadays a more easily accessible cover on top of the unit combined with an exclusive location of bursting disc provides even quicker and easier access. The top cover also facilitates regular inspection and periodic replacement of the bursting disc. The latest models offer top plate access with only four bolts and a captive cover plate. The four bolts swing away to allow the lid to pivot, giving access without the risk of any components being lost or falling from the unit and saving valuable time during maintenance inspections.

Fixing kits

Special TPS fixing kits are available that make installation much easier. They enable a TPS to be fitted safely and quickly from outside the tank, completely eliminating the need for hazardous, time-consuming and expensive welding work. They typically consist of a studded adaptor flange that is bolted and sealed to the tank before the TPS unit is mounted on to the protruding studs and secured in position. The use of fixing kits minimises the installation time for each unit, and also forms an even tighter seal against tank curvature on small diameter tanks.

The latest TPS models also offer flexible mounting dimensions. The length of the foam dispersal tube projecting into the tank interior can be specified by the system designer to accommodate site

specific mounting arrangements. The standard or minimum length of the foam dispersal tube is designed for pourers mounted directly on to the tank wall and positions the deflector plate at the optimum position inside the tank to spread the foam evenly around the interior. Where pourers have to be mounted on flanges away from the tank outer wall the dispersal tube length can be increased to allow the deflector plate to be in the optimum position inside the tank.

Pressurised tanks

Most TPS units today are designed for tanks where the internal pressures do not exceed 0.17 bar (2.5 psi). Where the tank is pressurised, for example with a nitrogen inerted blanket, or where high internal tank pressures up to 0.34 bar (5 psi) may be experienced during normal operation, a special type of TPS is recommended. It features a thick high pressure glass bursting disc and a unique valve arrangement. One-way flaps over the air intakes ensure the full pressure of the foam solution entering the unit is applied to the bursting disc to ensure it ruptures during an emergency, while allowing for variations in internal tank pressure during normal operation.

Precision control

The latest TPS models feature bursting discs fabricated from impregnated graphite instead of glass for precision control of the bursting pressure. Graphite ensures that the disc will burst when subjected to the pressure of foam entering the top chamber but will not burst or leak during normal tank operations such as filling and discharging. The use of graphite enables the bursting pressure to be held within tolerances of ± 0.05 bar (± 0.75 psi). This is almost four times better than achieved with glass discs.

In addition, improvements to the design of the disc holder and the use of an "O" ring seal allow the graphite disc to be replaced quickly and easily without changing the holder. The use of an "O" ring also means that no adhesive (which may be susceptible to attack by the tank contents) is required to hold the disc in the holder. Graphite is highly inert and so temperature-resistant and compatible with a wide range of corrosive chemicals.



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Top hats

To provide precise control over the ratio of foam and air, the latest TPS designs are fitted with a special top hat orifice plate assembly. Each orifice is specifically designed to allow the correct amount of foam solution into the foam-making tube after taking into account the supply pressure at the inlet flange, the foam type and concentration. In addition, a stainless steel sleeve above the orifice blocks off part of the air inlet duct ensuring the amount of air drawn into the foam generator is correct for the quantity of foam solution supplied. The unique combination of orifice and sleeve ensure that optimum foam expansion is achieved at every pourer and that optimum use is made of the foam.

Choice of foam

TPS units are compatible with all the main types of foam concentrate. While AFFF and FFFP are used in some instances, independent tests have shown

simulate large storage tank fires and subject foams to the most rigorous scrutiny. Some LASTFIRE certificated foams, such as Angus Tankmaster, have been specially developed to extinguish large storage tank fires involving hydrocarbons. Its FluoroProtein-based bubble structure provides exceptional resistance to heat, enabling it to pass through flames, impact on hot fuel and move over the burning liquid surfaces. Its bubble walls are tough enough to seal against even the hottest tank shells, and even under a torrent of cooling water its foam blanket remains in tact. Similarly, Alcohol Resistant foams like Angus Tridol ATF are ideal where polar solvent chemicals are stored.

Chamber of horrors

The importance of incorporating TPS units into a properly engineered foam system cannot be overstated. Systems should be designed in accordance with the NFPA 11 Standard using TPS models Listed by Underwriters Laboratories. TPS units are available in a broad range of sizes to suit most requirements. Typical capacities range from 75 to 3,300 litres/minute at inlet pressures between 2.5 and 10 bar. Each unit should be accurately factory-calibrated to provide specified flow rates at the required system operating pressures. This will ensure effective and cost-efficient use of foam concentrate and water resources when installed on new tanks or retrofitted to existing tanks during refurbishment. If TPS units are constructed from the latest heat-resistant materials and engineered to the highest standards, then they can be relied on to tough it out under even the most gruelling and adverse fire conditions. What should be avoided is a "chamber of horrors" that is difficult to install and maintain, does not make efficient use of water and foam resources and uses vapour seals that burst prematurely during normal tank operations.

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Michael Mills is Product Manager at Angus Fire responsible for the global marketing of the company's wide range of engineered products including foam-making equipment. Angus Fire is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers around the world and is headquartered at Connecticut, USA.

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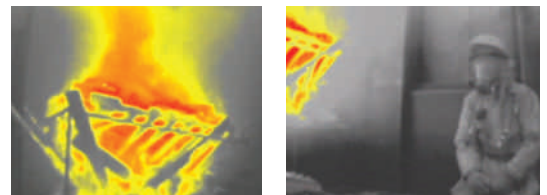
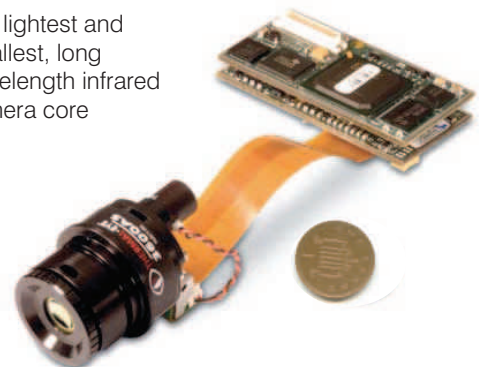
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Pic courtesy of Sage Technology



The Future of Thermal Imaging Technology

By Wes Sheridan

Sage Technology

To get a glimpse into the future and understand the path that the Thermal Imaging Camera (TIC) and its technology will traverse, one must first take a brief look at how and why we have arrived at the current state of the technology.

Historically the predominant development and application of the TIC has evolved out of the efforts by the military to function during the night, and by those organizations concerned with observing phenomena in outer space. The first equipment to reach the user was very large, very costly and had poor performance by today's standards. Only governments and research institutions could afford to participate meaningfully in the thermal imaging arena. The issues, in addition to cost, were all about size, weight, power and performance.

It is not a whole lot different today. But the scope of the issues has changed as has the order of importance, and the extent of influence each has in affecting the applications of interest. These issues are about the technology as well as the applications.

Let us first examine the directions of the technology.

Technology Overview: It is essential to discuss the technology highlights because the technology issues practically dictate the directions the future TIC will evolve. Besides, you are already confronted with the basics of the technology – it is the

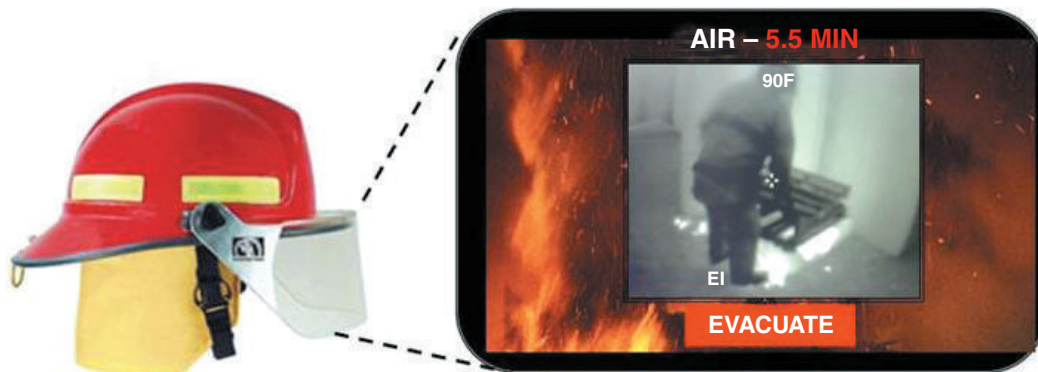
favorite means that marketing uses to convince you that their product is the better choice. Let's take a brief look at the major technology factors (no, you won't need an engineering degree to understand this).

It is not just the sensors

Just about any marketing conversation and product brochure will be quick to reference the sensor technology (eg. Vanadium oxide, Amorphous silicon, etc), the focal plane array (detector) format (160x120 pixels, 320x240 pixels, etc), the thermal sensitivity (<100mK) and typically the spectral response (eg. 7-14µm).

So what does this mean? Probably not nearly as much as marketing wants you to believe that it means. If the camera performs and provides acceptable imagery, has good reliability and fits the budget, these details diminish in importance. For military type applications where the performance is always trying to be advanced, these issues translate into longer ranges, higher quality imagery and improved dynamic response. There is a penalty for these performance improvements consisting primarily of higher costs, increased

Pic courtesy of Sage Technology



power consumption and typically size and weight penalties. For firefighter type applications the advancement of technology has less impact. Once you can see in the dark and through smoke, not much real advantage is accrued to a sharper image that is still being viewed through a scratched and fogged air mask, and with beads of perspiration irritating your eyes.

Once the basic performance has been achieved,

“good enough is best of all” capability takes on real meaning. At this point the focus needs to be directed to:

- make the unit smaller
- make it lighter
- make it work longer
- **make it cost less!**
- add functionality without impacting any of the above parameters

It is also about the electronics and software

The sensor technology has continued to progress to yield camera imagery that can appear nearly as dramatic as black and white video. This has happened with a lot of help from the electronic hardware and software that controls the sensor and processes the sensor data to yield the display image. As the electronics have shrunk to reduce size, weight and power consumption, they have also greatly increased in capacity and functionality to support larger and more powerful image processing programs. These advances in software for the TIC not only provide displayed imagery of unparalleled quality, but they can also deliver imagery from poorer performing sensors that is

One must look at the other parameters that go into the performance equation and judge the overall unit performance with respect to the needs of the user. That is the real issue.

perceived to be superior to that which can be obtained from more costly and higher performing sensors.

Naturally this contradicts some of the early marketing hype pertaining to the sensor format such as; “a 320x240 pixel array has superior performance to a 160x120 array”. Of course it can have superior performance, but not necessarily. One must look at the other parameters that go into the performance equation and judge the overall unit performance with respect to the needs of the user. That is the real issue.

There are presently a number of manufacturers of the sensor core that go into TIC applications, and there are a least four different technologies of

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types of sensors. There are also other companies that are pursuing new technologies for the sensor, and advanced development of the electronics and software. These efforts may be expected to continue to improve the camera performance and yield innovative features such as expanded temperature ranges and elimination of the need for FPA shuttering.

Technology Summary: The end result of the technological advances both historically and in the immediate future, will be the sustained improvement in overall performance, the reduction in size, weight and power consumption by the camera core, and a continuing reduction in the cost of the core that will level off at a plateau to be determined by the number of manufacturers, the intricacies of their respective technologies and the volume of cores produced. The specialized nature

There are presently a number of manufacturers of the sensor core that go into TIC applications, and there are a least four different technologies of types of sensors.

of the cameras will inherently limit the number of cameras produced, but the core cost could reach the range such that TIC's could be produced and sold for \$4000 to \$5000 in the next few years. This would be a fully functional high performance unit, not the "fire sale" version (no pun intended) that is occasionally seen today when manufacturers purge old technology units.

What if I don't care about the technology?

If the advances in TIC technology do not hold significant interest for you, it is enough to know that these advances will over time reduce the cost, size, and weight of the cameras while providing for improvements in performance. But there are practical limits to which these advances can reach.

Cost reduction will play a significant role in the future direction of the TIC over the next decade. As the end user cost dips below \$5000 and eventually below \$4000, the TIC begins to take on the character of being part of the firefighter's personal protective equipment. The increased availability and use of the TIC is already resulting in the adaptation and modifications of practices and procedures to better utilize the tools available. As experience is gained and confidence increases, the user community will innovate and discover new and more effective means to save lives and property, and improve safety for themselves and their communities. It is interesting to note that the reports from organizations where each member of the team is equipped with a TIC indicate that migration from old methods to new and innovative methods virtually starts on its own. When each member of a search team is equipped with a TIC, search times are greatly reduced and the safety of the firefighter and rescue victims is increased.

The most interesting futures for the TIC may be found in the new configurations and applications,

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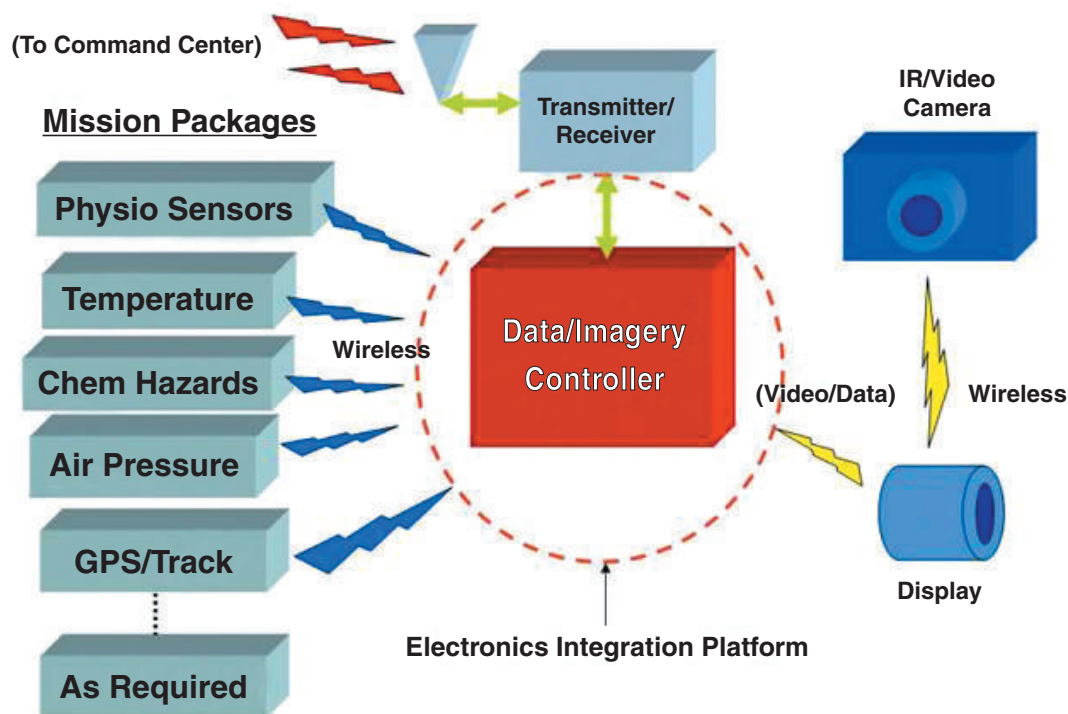
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Integrated Personnel Protection System



rather than in the basic functions of the TIC. These new applications have gained increasing interest and support in the last several years, and there are initiatives in process to expand the role of technology in the development of the "digital firefighter concept". The "digital firefighter concept" will bring together the various sensors and displays/indicators into a simple integrated system. The TIC is an integral element of the advancing technology applications in part because it supports two significant features; 1) the incorporation of wireless capability to support data and imagery transfer, and 2) the ability it affords the user to display both thermal imagery and vital safety information. Both capabilities are fundamental to realize the migration to a digital firefighter. And when constrained by standardized means to format, communicate and display data and imagery, the path to the development and integration of new systems and capabilities becomes less costly and less burdensome to the firefighter if all of his attention can be directed to a single display for routine and emergency information as well as imagery. Wireless based systems supporting position location, building layout, remaining air supply or team member health emergency status could be communicated and displayed as integral elements with the TIC imagery.

Some of the most dramatic and exciting paths for the TIC will be found in the methods of integration of the unit with other firefighter systems and subsystems. Sage is presently developing an Integrated Personal Protection System (IPPS) that integrates the sensor data from physiological sensors, chemical and biological sensors and radiological detection sensors into the wireless communications network of a First Responder. Both sensor data and IR camera imagery are presented on the TIC display, as well as being

transmitted to an Incident Commander's control console. The basic TIC function is retained much as it is in today's systems. But in the integrated environment more systems and subsystems can be monitored and managed by the firefighter/first responder, thus amplifying the capability and effectivity of the user. An example of the integrated display environment is depicted below.

The TIC may also undergo some radical reconfiguration to better accommodate the user of the future. Although a sensor/camera is required to capture the image, and a display is required to present the imagery, they do not necessarily have to be located in the same place. Low cost and low power transmitter/receiver modules could readily allow the camera and display to be remote from each other, affording the TIC a variety of new options. A flexible display on an air mask or face shield could be driven by a hand held or helmet mounted camera. Or the hand held camera could drive helmet brim mounted displays on a number of team member's helmets. The camera could be configured like a small flashlight that could also be bracket mounted to a helmet, thus blurring the lines between hands-free and hand held cameras. The associated display could be snapped onto the helmet brim, the flashlight itself, or drive a small modular display inside the air mask. The options are numerous and the user will be able to select the best fit for the application.

The technology is already mature enough to meet the needs of the first responder community. It works and works well. Over time the costs will decline somewhat, and the size decrease will help determine new implementations. However, the application innovations and the integration approaches will be the primary fuel that powers the transition to the next generation of thermal imaging cameras.

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Sage Technology is a systems development and integration company specializing in advanced development sensor systems for industry and the military. Sage has developed both hand held and helmet mounted "hands-free" thermal imaging camera systems for advanced technology evaluation, and for commercial production applications including firefighter TICs. Sage has experience with virtually every type of detector technology and with many of the suppliers of the sensor technologies found in contemporary TICs.

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New Technology SCBA – A Giant Step Forward

Ready for Action

By Larry Digney

MSA

The fire-fighter clocks on for his duty and dresses in his station clothes before conducting the pre-watch checks of his gear including his advanced new generation Self Contained Breathing Apparatus (SCBA) in the fire appliance jump seat.

When he gets to the truck he takes the Personal Monitoring and Signal Device that is attached to the right shoulder strap of the SCBA and presses the green button on the top left corner. Whilst holding down the button the LCD screen lights up and a small data icon appears on the screen. He takes his personal issue Identification Tag from his belt and holds it on top of the Personal Monitoring and Signal Device, it beeps and the light goes out.

The fire-fighter's personal identification details are now logged into the Telemetry Integrated Control Module.

After completing all his checks and starting his normal duties the fire emergency siren sounds and he is paged with his team to his vehicle to attend a large building fire in the city. As he swings into his seat, he attaches his SCBA harness and waits

until he arrives at the fire site. Upon arrival he leaves the vehicle wearing his SCBA. His commander tells him to prepare to team up with his partner and enter the building to search for possible victims with his new High Definition Thermal Imaging Camera. The commander opens the cover on the Tablet PC Base Station and pushes a single button to switch it on.

The fire-fighter opens his SCBA cylinder valve and the system is pressurized. Without another action by anyone a complete historical record of all events from here on has been activated. There is a beep on the fire-fighter's Integrated Control Module (ICM) as it springs to life after being activated by a radio signal received from the Backplate Transmitter on the fire-fighter's SCBA.

The fire-fighter starts to breathe from the SCBA and enters the fire scene to search for possible



missing people. Before a minute has lapsed the fire-fighter's details have been received on the command centre's Base Station Screen and they are automatically placed into his team with his partner. His name, team identification details, cylinder pressure and minutes to low pressure warning alarm are available on the screen. This information is updated every thirty seconds based on the previous three minutes of air consumption. No action is required by anyone for this to occur.

For the first three minutes of breathing the pressure of the cylinder is visible on the Base Station Screen but after that the minutes to low pressure warning activation are shown.

His buddy stops to listen and doesn't move for 20 seconds and his Personal Monitoring and Signal Device starts to beep to remind him that it is also a personal motion alarm, a slight movement by him and the beeping ceases. They move on but the commander is now concerned that the building has deteriorated to a dangerous state and he wants to evacuate the team.

He seeks the evacuation icon on the screen and activates it. He is asked by the computer "ARE YOU SURE?" He clicks yes and the evacuation signal is immediately sent. He sees the identification markers on the screen that confirm that the signal was successfully sent and received by the Personal Monitoring and Signal Device. Inside the deteriorating building the two team member's Personal Monitoring and Signal Devices burst into alarm and both fire-fighters look at their screens. The signal is un-mistakenly clear . . . **evacuate**. They cancel the alarm by pressing the yellow button on the side of the Personal Monitoring and Signal Devices twice. The alarm sound ceases but the evacuation icon remains on the screen. The commander can see that both fire-fighters have received the signal because the screen identifier

showing that they have cancelled their alarms is now visible.

30 seconds later the two fire-fighters successfully exit the building just before the roof collapses and a catastrophe is avoided.

All data relating to cylinder activation, commencement of breathing time, air consumption rate, temperature, alarm activation time and type of alarm are all recorded in the Personal Monitoring and Signal Devices and in the Base Station.

Historical Perspective

Since the introduction of Self Contained Breathing Apparatus in the 1950's there has been steady progress towards achieving the ultimate outcomes associated with its use. First there was the requirement for delivery of enough breathable air at a stable pressure with a suitable flow rate to allow a single user to operate comfortably in toxic and dangerous atmospheres without air starvation.

The slow progress in achieving suitable pneumatic performance can be traced to the requirement for designers and manufacturers to achieve a suitable return on their investment and because it was occurring in the heady days before computer aided design and elaborate test equipment and protocols came along to make advancement and development easier.

When real performance upgrades eventually started to provide sufficient air for one operator to breathe comfortably then progress began towards the advent of second mask attachments so that two operators could breathe comfortably.

The exponential technological growth potential increased throughout the late 1980s and early 1990s with positive pressure becoming almost mandatory and flow rate minimums increasing to 300 lpm and then to 450 lpm. Light weight

fibreglass covered cylinders came and were soon made redundant by the carbon fibre composite revolution. By the end of the 1990s things were looking up for the users of SCBA with light weight materials, superior performance and only minor technical barriers between what was available and what was deemed necessary for the ultimate SCBA.

A Great Leap Forward

That was the cue for manufacturers to stand up to the plate and take the lead in the revolution of SCBA into the 21st century. The new generation designs appeared in 2003 and the future of SCBA was suddenly here. In a flurry of technological advances, technicians around the globe designed and manufactured the first truly user friendly Self Contained Breathing Apparatus with fully functional automatic telemetry capabilities, full integrated ergonomics in the carrier system and new innovations in the pneumatics.

In one tremendous step forward for emergency workers, who operate in some of the most hostile environments on earth, the next generation protection is available today.

The new generation designs are based on revolutionary SCBA with improved pneumatics technology that provides over 500 lpm of air flow for two users with positive pressure protection and all new pressure reducers which now provide a staggering 9 year overhaul period.

One pressure reducer design incorporates a patented single air-hose providing both high pressure (HP) and low pressure (LP) air service in the same hose. That hose is directed up through a protective channel in the multi functional back-plate and over the left shoulder to the air distribution block which is located on the users left chest.

The air distribution block at the end of the integrated high and low pressure air-hose houses the two safety couplings to cater for two demand valve hoses, the high pressure gauge and the low pressure warning whistle. A secondary analogue gauge is included in the system even though there is also a digital gauge integrated into the telemetry system.

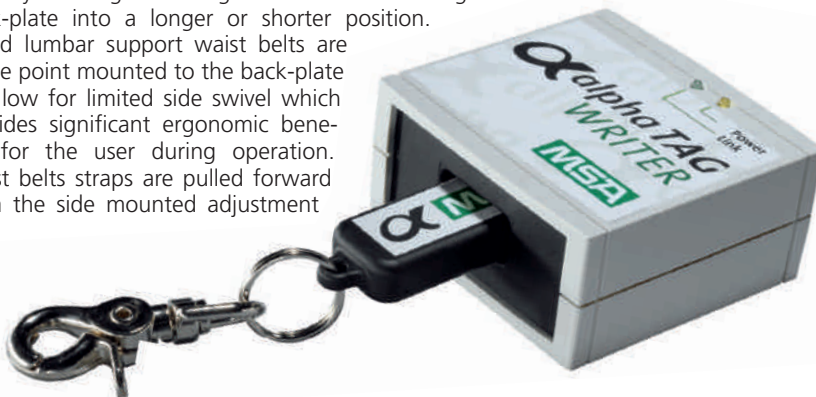
Demand valve models include unique hemispherical shape designs that allow emergency service workers who operate with fire fighting or safety gloves to handle the control knob with ease. The demand valve is attached to the full face mask via a patented self centring docking system.

The docking system allows gloved hands to easily locate and dock the demand valve onto the mask. In another user friendly feature the demand valve switches

from positive pressure to the park position as it is removed from the mask without operating any additional buttons or levers.

There have been major steps forward in the critical area of ergonomics. Back-plate designs make it possible to easily adjust to three different lengths so that any user from shorter than 1.5m to taller than 2.0m can wear the same SCBA without discomfort or incorrect sizing. Adjustments are rapidly and easily achieved before donning the unit by moving two large buttons and sliding the back-plate into a longer or shorter position.

Broad lumbar support waist belts are single point mounted to the back-plate to allow for limited side swivel which provides significant ergonomic benefits for the user during operation. Waist belts straps are pulled forward from the side mounted adjustment





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buckles in a manner similar to that used in the design of parachute harnesses.

Shoulder harnesses manufactured from sandwiched padded flame retardant material include designs that attach all the components together at the top. This prevents the shoulder straps from falling off the shoulder if they are not sufficiently tightened.

With so many outstanding SCBA pneumatics and carrier system developments taking place, a true Microsoft Windows based telemetry system has been designed. This can now provide unprecedented data communication between the SCBA and the user and also the control centre outside the danger area.

These systems include a number of individual parts that operate together to achieve the desired outcome:

- A small actuation device that operates when pressurized. It is attached to the SCBA backplate and to the pressure reducer by a high pressure tube. When the unit senses pressure from the HP reducer, it transmits the pressure via a radio signal over a very short distance.
- An interactive, user carried, Integrated Control Module is the core of the system. It is attached to the carry harness of the SCBA with a releasable clip and is easily accessed and read by the user. The system is fully automatic and requires no actions from the operator to start it or operate it. It switches on whenever a transmission is received from the SCBA it has been mated to. The Integrated Control Module has three functional buttons and a large LCD screen. The three buttons provide the user with the ability to send a distress signal to the base station, provide backlight in bad visibility situations and switch off all the alarms except the high temperature and low pressure alarms which cannot be switched off until the SCBA has been de-pressurized. The Integrated Control Module also enables the user to receive an evacuation signal from the base station, view the time until the low pressure warning signal activates and to check the cylinder pressure at any time. The centrally located personal alarm button flashes green when all functions are within normal parameters and it switches to red when ever an alarm or distress signal is activated. This feature allows all operators within visual contact of each other to see the status of their companions Integrated Control Module. This device will also monitor

atmospheric temperature and goes into temperature alarm if the time weighted average of the temperature that the operator has been exposed to reaches a dangerous level. The Integrated Control Module carries 50 hours of user activity in its onboard memory. Any new activity will override the oldest data stored on the Integrated Control Module. The data can be downloaded from the Integrated Control Module to a computer if necessary.

- A Tablet PC is used for the base station. It is a rugged, sturdy design fitted with a receiver and transmitter module and it has been programmed to run a comprehensive telemetry computer program. The Tablet PC is another stand alone component of the system. It does not need to be manned at all times because the extremely flexible Integrated Control Module can be programmed to be many things, one of which is an alarm pager. When the Integrated Control Module is switched to the alarm pager mode it can be carried by a control operator who operates within 50 metres of the base station and it goes into alarm to alert the control operator of a situation that may requires his attention.
- There is an alternative base station that attaches to a standard laptop computer.
- A Tag Writer is the component of the system that allows for users personal details to be written to the user's personal identification tag. It is also the interface component that allows for data that has been stored on the Integrated Control Module to be downloaded to a computer.
- The personal ID tag, with user identification details are very simply transferred to the Integrated Control Module so that the data that is being recorded during operation can be identified to the user. The Tag can also be easily used to activate the Integrated Control Module to perform other functions such as a repeater station that acts to transmit data that cannot be reached in a direct line by another user, an alarm pager, and it can be used to put the Integrated Control Module to sleep to save battery life.

The one conclusion that can be drawn from the introduction of new generation Personal Monitors, Self Contained Breathing Apparatus and Telemetry Equipment is that emergency workers lives are now much safer and the future looks more positive as developments for even more advanced features are pursued.

APF

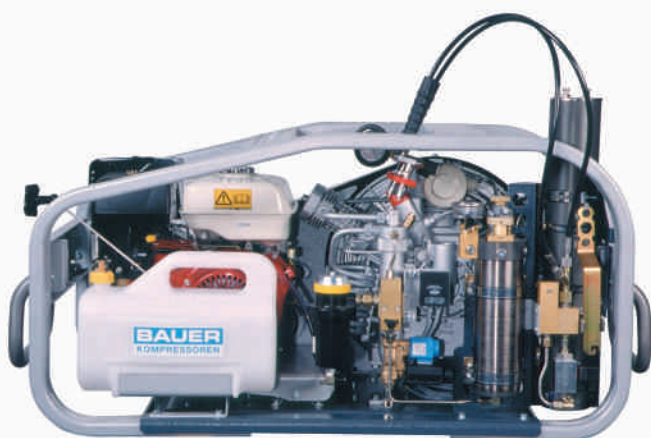


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Don't Learn by Accident

The Importance of Training

Recently, a group of contractors were at a petrochemical facility in the United States. Their portable single gas detectors began to alarm, showing dangerous levels of hydrogen sulphide (H_2S). Knowing that there was no H_2S present in the facility, the contractors continued to work. An eventual investigation into the incident showed that the contractors were being exposed to sulfur dioxide (SO_2). Their detectors were alarming because of the cross-sensitivity reaction of the H_2S sensor to SO_2 .

By Sarah Ursulan

Communications
Coordinator
BW Technologies by
Honeywell

Although none of the contractors perished, the incident could have been potentially deadly. With proper training, the workers would have reacted to the alarm situation without analyzing why their monitors were going into alarm. However, believing that proper training and procedures would be paramount at all facilities would be a complacent misconception. Despite large profits, many companies neglect the training of their workers, contractors and visitors. Inadequate training in all areas of gas detection, can easily lead to serious accidents, even fatalities.

Training is an integral part of safety. Providing a worker with a gas detector and showing them the

area in which they will work is not a recipe for success. Without educating workers on how to properly use all necessary personal protective equipment (PPE), safety training and the importance of procedures, employees and facilities can always be at risk.

Unless you know what to protect yourself from . . .

If you are not aware of the dangers present in the workplace, you cannot protect yourself from them. Education on the theory of gas detection is an important start. Industries that entail confined space entry can be very different from each other,

even though the four most common hazards are oxygen deficiency, hydrogen sulphide, carbon monoxide and methane. For example confined space entry in aircraft fuel tanks presents the danger of jet fuel while in wineries and breweries, the threat of carbon dioxide presents an additional danger. Training workers on the hazards specific to their application and industry increases the safety of staff and the facility.

Understanding the symptoms of exposure is significant after learning which toxic hazards may be present in the work environment. The misconception that hydrogen sulphide (H₂S) always smells like rotten eggs can be potentially deadly. At low concentrations, H₂S does smell of rotten eggs, however at 20 to 30 parts per million (ppm), sense of smell is deadened by paralysing the respiratory centre of the brain and olfactory nerve. If workers are relying on sense of smell to alert them to the danger of H₂S, levels may reach deadly concentrations. With proper training, an understanding of

procedure and training were both at fault for the accident. With basic hazard recognition training and portable gas detectors, workers could have been alerted to the dangerous atmosphere. The lack of proper policies and procedure were also to blame.

Rules

The tragedy at the Sullivan Mine illustrates the importance of having strictly enforced policies and procedures that all employees and contractors are made aware of repeatedly. The owners of the mine came under scrutiny for not posting signs alerting staff to the confined space in the shed and for having employees working alone without periodically checking in.

Having all employees, contractors and visitors adhering strictly to the rules and regulations of a facility improves safety, but everyone must be aware of the guidelines. Repetitive training reinforces knowledge of the rules at the facility.

Similarly, being familiar with the NIOSH or

PPE may vary between facilities, industries and applications, and can include fall, hearing, foot, eye and respiratory protection in addition to a gas monitor. Understanding what a portable gas detector can do and what it cannot do allows workers to maximize their protection.

dangerous ppm levels and their corresponding physiological responses for all gases that potentially are present can be used to assess situations and properly interpret gas detector readings.

Training on the theory of gas detection also includes the characteristics of toxic hazards. Carbon monoxide is colourless and odourless. Without a gas detector, its presence may go unnoticed until hazardous levels are reached. With a better understanding of gas hazards, the need for safety measures is emphasized.

Similarly, exploring the causes of potentially deadly atmospheric hazards is a fundamental part of gas detection theory. Oxygen deficiency is a concern during confined space entry, and causes can include displacement, microbial action, oxidation and combustion.

In May 2006, a contractor, Doug Erickson, entered a shed built above a water pit to collect drainage water for sampling at the decommissioned Sullivan Mine in B.C., Canada. Low oxygen air had been seeping into the sump from a drainage pipe creating an oxygen deficient atmosphere. Doug Erickson succumbed, but was in the shed for two days until another contractor, who was also working alone, attempted to locate him. That employee and two paramedics who later entered the shed also succumbed. Issues and shortcomings in proce-

OSHA guidelines that govern your facility is important for all staff. Training and awareness are the first step in creating a culture of safety.

More Training?

Training specific to certain industries and applications is often available. Confined space training is available to increase awareness of potential dangers. Upon completion, participants are able to identify confined spaces and understand the associated hazards. Additional courses may cover proper entry procedures, how to operate within the confined space and utilizing appropriate personal protective equipment (PPE). Any employees who may have to make a rescue from a confined space can take special courses usually including simulated rescues.

After completion of gas detection theory, procedural orientation for the facility, and confined space training or other courses applicable to your work environment, it is important to know how to properly use your personal protective equipment (PPE). PPE may vary between facilities, industries and applications, and can include fall, hearing, foot, eye and respiratory protection in addition to a gas monitor. Understanding what a portable gas detector can do and what it cannot do allows workers to maximize their protection.



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Back to Basics

Every gas detector comes with a manual that explains the standard parts of the monitor (including sensors and batteries), activating and deactivating the detector and how to attach accessories. Comprehension of a detector's abilities allows the user to maximize its efficiency. Always read and continue to review the manual that comes with your personal protective equipment.

User options allow the customization of the detector to suit certain applications and situations. With multi-language support, workers can understand the information that the device is providing. A passcode protect function may be equally useful in preventing unauthorized access once the detector is used in the field. Without adequate training, these user options may not be properly utilized leading to potentially deadly situations. If a worker cannot understand the information provided by the detector, they may be put at significant risk.

Cleaning and caring for a gas detection device properly also allows for maximum efficiency. Cer-

erly between calibration intervals. Today recommended calibration intervals vary, but there is unanimous agreement amongst manufacturers that verifying the function of portable safety gas detectors between calibrations is necessary. Since many users do not understand why functional bump testing is necessary, the practice is often not adopted. In some areas of the world functional bump testing personal gas detectors between calibration intervals is virtually unheard of. Training on all aspects of gas detection will help create an awareness in these countries.

Photoionization detector sensors can suffer a loss of sensitivity if internal components such as the ultraviolet lamp or sensing electrodes become dirty through everyday use. Performing a functional bump test with a known concentration of gas will enable the user to determine if the PID is responding properly.

Even though the gas detector performs diagnostic checks at start up and during operation it is often not possible to detect a problem with sensor

While calibration adjusts sensor accuracy, between calibrations the only way to confirm that a gas detector is functioning properly and is capable of responding to gas is to expose the instrument to a concentration of target gas high enough to initiate an alarm situation while the instrument is in operating mode in a fresh air environment.

tain solvents, citrus, alcohol or silicone based products, soaps or polishers should not be used to clean the exterior of detectors. Choose the manufacturer recommended cleaner in order to ensure the sensors and detector are not being damaged.

Proper maintenance of a gas detector goes beyond cleaning. Calibration and bump testing is an important part of ensuring that a detector is functioning properly.

While calibration adjusts sensor accuracy, between calibrations the only way to confirm that a gas detector is functioning properly and is capable of responding to gas is to expose the instrument to a concentration of target gas high enough to initiate an alarm situation while the instrument is in operating mode in a fresh air environment. This procedure is often referred to as a functional bump test.

In the evolution of safety gas detection instrumentation, functional bump testing is a relatively new practice. There was a time when calibration was recommended frequently, even daily, but as sensor technology and sensor performance became better understood, the frequency began to lengthen. As calibration frequency decreased it was just assumed a detector was operating prop-

response. For example, the detector can not warn users that sensor ports are obstructed by dirt, oil, or some other substance, the capillary pore of an oxygen sensor is blocked, or the catalytic bead of a combustible sensor has been poisoned. Either way, if gas is not able to reach the gas detector sensor, the sensor is not able to detect its presence.

In addition to training through the use of manuals, many gas detector manufacturers and distributors offer training sessions that are specific to certain industries and applications. Interactive training CDs are produced by some companies and can be a useful training tool.

Reinforcement

Continued education is important to reinforce what is learned during:

- Gas detection theory
- Facility rules, regulations and procedure
- Gas detector training

Without repeated training sessions, complacency can set in. Training on atmospheric hazards and how to safely work in potentially dangerous environments is imperative to the safety of both the employees and facility. Above all, training should never be neglected.

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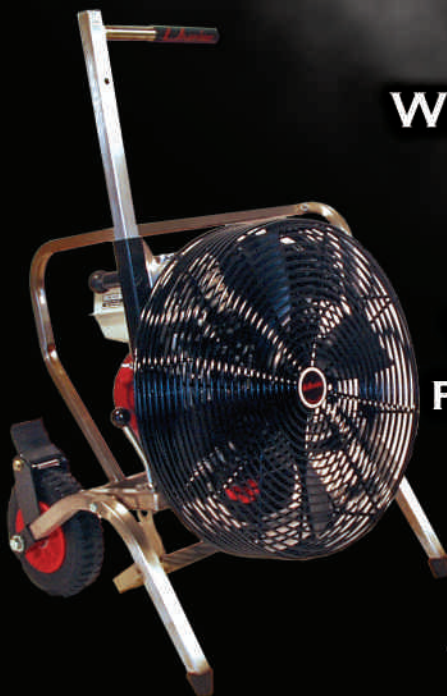
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Hydraulic Rams versus Lifting Bags

Lifting heavy structures. Hydraulic or Pneumatic?

The need for lifting a heavy object is a common scenario's during a rescue operation, such as the need to lift a truck during a road traffic accident or a structure during a collapsed building. Which tools are available for this task and what are the aspects to keep in mind when using lifting equipment. I often get confronted with the question which tools to use for lifting and what to keep in mind.

By Jack Kusters

Managing Director,
Artesis Academy

Most people prefer the use of lifting bags but I also get the question if hydraulic rams can be used. Most logical and best tools for the job are lifting bags, but what would be the reasons for that? To answer the question I will go into lifting in general, the aspects involved which will give the basics in order to be able to answer the question at hand. What to keep in mind when lifting and the importance of training and choosing the right equipment.

Emergency Lifting in general

Emergency lifting is, or should be common tasks in a rescue environment. Lifting is generally used for two objectives. 1. To create space to free an entrapped victim, or 2 to lift an object to be able to extricate the victim in the object it is trapped in.

Although there are more scenario's where lifting tools are used, most common are in collapsed structures, and in road traffic accidents involving heavy objects like a truck. It is a common thought that lifting is generally performed during a collapsed structure or entrapment below a large object. But the need for lifting during a road traffic accident is much higher than many times perceived. When a car is trapped under a truck the necessity to lift the truck of the car first is as essential as the extrication performed afterwards. The reason for this is simply that the load of the truck is resting on the car that will be cut. As long as the load is resting on the car, extrication cannot and must not be preformed! Shifting of loads can have are huge impact. The victim can get entrapped even more or the shock due to the load

shifting can hurt the victim. Nobody should want this and take the risk not to first lift and stabilize.

My motto is in the case that an object is stuck under an object, is to Crib, Lift, Follow the Load, Secure and then Extricate. In the five step approach there is one point to discuss separately and that is following the load. It is often thought that when lifting there is only a need to secure at the end of the lift, but no that is not enough! Always follow the load with a tool not used for the lifting operation. If the load shifts or the load drops it is caught by the tool stabilizing the object. For small heights this can be cribbing blocks and for higher objects struts or shoring tools are most generally used. There is a saying in the US by a colleague that says, lift a inch, crib an inch and fully agree with that statement.

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For securing the object, the same tools are used but then the object is put fixated and be able to shift anymore.

This principle is the same for lifting objects which the case of a collapsed structure or with an entrapped victim that only can be freed by lifting. There is a rule of thumb called the shoulder to shoulder. Lifting never needs to go higher then the width of the shoulders, as this is enough to free a victim generally. This being said, there are always exceptions to the rule so your tools needs to be able to go higher.

Aspects of lifting

To understand which tools can be used and which equipment is best suitable, it is necessary to look at the scenario and objectives more closely.

The main objective is to lift an object to a needed height in a safe and controllable manner. This all boils down to ensuring the least amount of risk for the operation. Sometimes a tool may look like the best and fastest option, but what risks are you taking? This is essential element in lifting! So many times I have seen and heard operations where the scenario was not talked through well and choices were made too quickly to save a little time in the beginning. This has negative consequences. Examples include that the point where lifted from could not hold up the load. Or the tool used could not make the whole lift required. Not stabilizing and therefore allowing the load the shift making the tool roll out.

Things that influence the risk are the stability during the lift, and things like safety factors. A



main topic is the radius, or arc movement that is created during a lift. An object is never lifted straight up into the air. (If it does, it means you are floating a load, which should never be attempted. One fixed point should always be secured and act as rotation point.) Seen an object is lifted from which one side secured a radius or arc will be created. Your tooling should be able to cope with this arc movement easily.

Other aspect is height in relation to capacity. Capacity or force is simply pressure x area. So to create equal capacity with a smaller area more pressure is needed, and visa versa. How this relates to your tooling we will discuss later on.

An other aspect is contact area. The smaller the surface area you are lifting the higher the forces you are putting on the object. Height is in relation to insertion height and extended height is another aspect. In lifting insertion height is essential, mostly to be slim enough to be able to insert and find the correct point to lift from.

Last but not least is the ease of use. How fast can the systems be deployed? How easy can you lift? Think about placement, but also about the need for cribbing, sharp objects and the availability of hard point to lift from (keep in mind the relation to the forces you are putting on the objects. The smaller the area you are lifting from the stronger it needs to be).

Rams versus Lifting bags

Having explained the aspects of lifting you may already understand why I promote the use of airbags almost anytime above the use of rams. I will explain my point of view, by stating that rams seem easy to use and a quick solution but it is not when this is put next to the risks involved.

When using a ram to lift, the length or insertion height is enormous which results in the need to place the ram on the outside of the object that needs to be lifted. On the outside of the object the strength of your lifting points tend to be lower than inwards. Think about the chassis compared to build up or roof buildup of the truck. Or the edge of a concrete structure compared to the inside of the structure. When using rams this point is worse seen the lifting surface area. With a ram it is extremely small putting more stress on your object that needs to be lifted which makes the need for a strong lifting point more essential. At the same time don't forget the ground surface. Lifting a load cannot be done a soft surface due to the same surface area. This will result in the need for cribbing costing time.

Another point is to the arc movement we talked about, and that is that the further away from the turning point (fixed point) the higher more the arc movement needs to be. Rams and the extensions

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used are not intended to cope with an arc movement (see drawing). With a high arc lift it is not recommended to use a ram.

Another point is the lifting itself. A large object needs to be lifted on two points generally. Using a ram would mean that two rams should be operated simultaneously. This is a delicate process! Two people close to the lifting object trying to coordinate exact timing is not easily done. Lifting bags truly share the load and can be monitored by seeing the pressure in one central point. Related to this point is that if rams are used the hard point used to lift, many time is also the point needed to secure the load with struts.

Besides the arc movement we talked about rams are less stable than airbags. The surface area is so small that a small change of load can be enough to trough the whole operation lose.

Other downsides of a ram are the weight compared to lifting bags. Another difference



between rams and lifting bags are that rams have the same lifting capacity throughout the lift seen the one action cylinder. Lifting bags in general get a smaller service area seen they become rounder, losing power when they get higher. There are both advantage and disadvantages to both.

That brings me back to my starting argument to see if rams tend to seem easier in use than airbags. I can understand why this may seem. Many users still see lifting bags as the square bags that are hard to stack and have limited height. A lot has changed, but will be discussed below. A ram is a more commonly used tool which is hold by hand, where at the moment you operate, it moves the object. But I hope the above shows that this is a limited view.

With rams it is as necessary to know what you are doing as with airbags. Mistakes are made during the cribbing and securing not in lifting so much. I have noticed that this is due to lack of basic knowledge of lifting in general and not because of the tool. I have seen incidents with both kinds of tools where loads shift (making the tool roll out) and people put it under bad luck or blame the equipment – let me be in your face and say this has nothing to do with bad luck, but just not following basic principles like cribbing and securing the load. With airbags there is less risk and are easier to use, but you have to know the basics.

Lifting equipment

Things have become a lot easier since the first introduction of lifting bags. Let's look into some of the equipment for safely and quickly lift.

If you still like the capability to be able to lift something with a ram take a look at the accessories available. Like special adaptors for more grip or a ram jack that several suppliers offer.

For lifting bags we mainly are three systems available. Low pressure 1bar, Square 8 bar bags, and the NT lifting concept at 10 bar. The low pressure are to unstable to be used in rescue



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operations where most fire brigades don't use them anymore. The new technology bag, revert as NT bags, combine the advantages of low pressure and high pressure. They have the height and surface area of a low pressure bag and the capacity of a high pressure one.

The difference between the square and NT bags are many of which one is the ability of the NT to be connected, which gives the NT bag the ability to lift to any needed height and coop with the arc movement. Another big advantage is the ability to lift directly on hard points eliminating the need for time consuming cribbing material.

When looking at a bag purchase also look at the capacity of a bag in specific height, as bags tend to lose capacity when growing, as a result of a smaller surface area. Of course safety factors and easy of use of the accessories is also important.

Other equipment necessary are cribbing material and struts. Nowadays rescuers generally do not use wood anymore but the compressed plastic ones. They come in all sizes and shapes. Some allow the cribbing to easily follow the load during a lift. Struts come in all shapes and sizes. Mostly keep in mind ease of use and versatility, that can make it easy to follow the load.

Summary

Lifting is an essential operation for emergency scenario's where attention should be sent in choosing the right equipment and training. It is my opinion lifting bags are the only tool for lifting object in most scenarios. With lifting it is essential to know

what you are doing then lifting is not hard at all. Always follow the simple steps: Crib, Lift, Follow, Secure and Extricate.

To learn more about emergency lifting or get training contact Jack Kusters, at Artesis Academy. **APF**

Jack Kusters is a expert in extrication and rescue in general. With over more than 29 years as a fireman he has worked for several organisations. He started as a fireman and did the rescue job in practice. Several educations and training later he was promoted to fire chief but his love for the extrication stays. He wrote several books and articles and gives lessons all over the world. Many of the tools and equipment that we use now in extrication are the brainwave from Kusters, where manufacturers have translated the idea into a useful product. These included the development of hydraulic tools, stabilization and lifting equipment for different manufacturers. At the beginning of the 90's, he developed a new system for extrication for the Dutch emergency response services. He was asked by the Dutch government to investigate all techniques used around the world to see if it would be possible to improve them and come up with a global approach. This has become known as the "Kusters" approach.

Kusters is now managing director for Artesis Academy. An international advisory organisation that helps fire fighting services in several areas such as training solutions, development of guidelines and the building of training centers.

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New Fire Protection Technology for LNG Hazards

Angus Fire has conducted a series of pioneering large-scale tests on the effectiveness of foam and application equipment on Liquefied Natural Gas (LNG) fires. Natural gas is the cleanest burning of all fossil fuels, and global demand for it as an energy source is growing rapidly. The tests were organised to re-evaluate current fire protection equipment and techniques in realistic fire scenarios. The venue for the tests was the new world-class LNG testing and training facility developed and sponsored by BP in collaboration with Texas A&M University Emergency Services Training Institute (ESTI).

By Mike Willson

Angus Fire

Cold fuel

When natural gas is chilled to -164°C at atmospheric pressure, it condenses into a cryogenic liquid, takes 620 times less space, and can be economically shipped around the world aboard ocean-going tankers, just like oil. Once landed, it is transferred to storage tanks, and then returned to its gaseous form before being fed into pipelines to reach industrial end-users and domestic cookers and gas boilers.

When LNG is warmed up and turned into natural gas it is flammable within a very limited range. If the mixture of natural gas with air contains less than 5% natural gas, it cannot burn because it is too lean. If the mixture contains more than 15% natural gas, it is too rich to burn. But

between 5 and 15%, watch out!

The big problem with LNG is that if it catches fire it gives off twice the amount of heat of an equivalent sized gasoline fire! Heat emissions are the principal cause of damage from LNG fires, capable of causing severe damage to personnel, structural steelwork, plant and adjacent facilities if left unchecked.

The props

LNG terminals and facilities follow practices that are different in some ways from those in other industrial installations. For example, many LNG facilities have piping laid in trenches to contain any leaks. ESTI has a 19m^2 L-shaped trench to simulate just such an LNG pipeline.

Flames shoot 30 metres into the air during LNG fire tests



The new facilities at ESTI, referred to as “the props”, consist of four parts – a trench; two 1.2m deep pits with areas of 9.3m² and 65m²; and a third pit, 2.4m deep covering 45m². The three pits represent typical impounding basins in an LNG facility. The third pit includes a simulation of the LNG manifold on an LNG tanker and the steel deck and hull of a ship simulating the facilities used during LNG offloading. The added depth enables a water base to be used that simulates the sea.

Vapour dispersion

If LNG spills on to the ground, it starts to vaporise instantly. The cold LNG vapour condenses moisture in the air above to produce a white vapour cloud. Containment is the first objective. Then there is the option to allow this process to continue, provided you can control the vapour and there is no ignition source nearby.

Alternatively, the flammable vapours can be dispersed away from potential ignition sources more quickly by warming up the LNG. Water or low expansion foam should not be applied directly on to LNG to do this, since the heat transfer from the water causes a severe reaction as a result of the LNG vaporising too quickly. This was graphically demonstrated in the “marine pit” where LNG

vaporisation rates on water were around five times that on land.

Water curtains can be used to control the drift of the LNG vapour. But these can be difficult to place correctly with changing wind direction, and the water must not be allowed to come into contact with the LNG spill.

A good quality Expandol high expansion foam blanket is a far more gentle and effective way of warming LNG and controlling vaporisation. The highly aerated foam at 500:1 expansion ratio provides a thick, light blanket with much lower water content per unit volume than conventional low expansion foams.

The 65m² pit was used to simulate an unignited LNG spill from pipework or a bulk storage tank. Expandol high expansion foam was observed to reduce ground-level vapour concentrations within seconds to well below the Lower Flammable Limit of 5%. A layer of frozen foam was formed at the LNG/foam interface that supported several feet of additional foam. Ice tubes also formed where the vapours boiled through the foam blanket. As the vapours ascended through the foam, they were warmed, became lighter than air, rose upwards, and dissipated safely in the air well above potential sources of ignition.

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Angus LNG Turbex applies Expandol high expansion foam despite searing heat of LNG fire



Fire control

If vapour finds an ignition source it is likely to be at the edges or outside the white vapour cloud, and the flames will burn back to the liquid pool and generate intense radiant heat. A high performance dry chemical powder like Monnex can put the fire out quickly, provided it is not too large and does not have any obstructions. However, this is not always desirable since a potentially flammable vapour cloud may subsequently build up above the liquid and pose a risk of re-ignition. Should the

LNG vapours enter a semi-confined space, damage could occur from the resulting ignition.

The accepted and proven best approach is to use high expansion foam of 500:1 expansion ratio to achieve a controlled burn-off and in the process greatly reduce the radiant heat emissions. The principle is to apply it fast enough (within 60 seconds) and at a high enough application rate to get control quickly and avoid potential risk to personnel, plant and equipment.

As the lower portion of the foam freezes, ice

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builds up within the foam blanket, venting the vapour in a controlled way, producing flames of greatly reduced intensity on the surface. The foam bubbles insulate the LNG from the heat source above, controlling the release of vapour. As the heat breaks down the foam blanket, more foam must be applied regularly as a series of pulses until all the LNG has burnt away.

Foam and application techniques

Initial small-scale tests were carried out to assess the effectiveness of different types of foam and application technique on a range of LNG fires. A variety of application techniques were used including low, medium and high expansion as well as low expansion compressed air foam (CAF) systems. Low expansion foam delivers too much water to be effective. Dry CAF performed slightly better when applied gently, but the logistics and equipment required to produce the foam was impractical.

Slow-draining Tridol ATF foam applied gently through a hand-held medium expansion foam branchpipe was observed to control the fire and achieve a significant reduction in heat radiation. This was only considered suitable for small-sized spills due to the high application rates required.

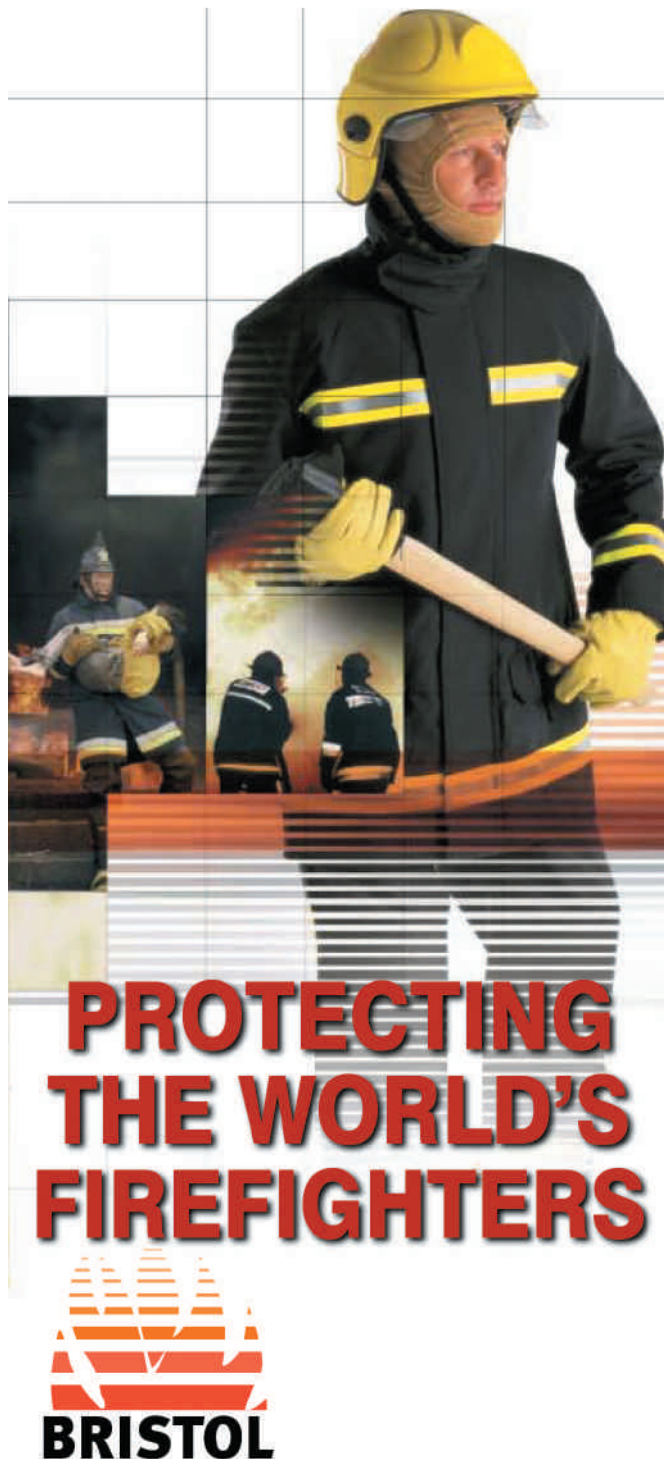
Large-scale tests were then carried out to simulate a major spill fire in a containment pit or the bunded (diked) region surrounding an LNG storage tank. LNG was placed in a huge 65m² test pit, the largest of its kind in the world.

The procedure to ignite the LNG was to allow a vapour cloud from the LNG to extend out from the pit over a distance of open ground. A white cloud was observed where the cold LNG vapour condensed moisture in the air. The flammable vapours were then ignited using a torch on a 3m long pole. Flammable vapour levels of 5 to 15% are normally expected on the fringes of the visible cloud, but portable gas monitoring equipment detected pockets of flammable vapours up to 150 metres from the visible cloud.

Once the vapour cloud was ignited, flames shot in all directions consuming and mixing the gas, which burned through the extended cloud back to the source, turning the pit into a burning cauldron of fire. The flames reached over 30 metres into the air and gave off so much heat that personnel were forced to retreat to a safe distance.

In the past, fire testing of LNG tended to be carried out on wet sand or earth pits which often had sloping sides. These are easily cooled by the LNG, making the test easier as moisture in the soil freezes and absorbs heat, avoiding the heat attack on the foam seen with concrete. Therefore they are not as representative of today's more common vertical-sided reinforced concrete impounding basins.

Historic test data using various foam application rates with outdated LNG storage and handling techniques provides no margin for safety in the modern world. Only foam and equipment proven to be effective in practice on fire grounds like the ESTI facility for prolonged periods of use are now acceptable to BP and main contractors invited to watch the testing over the last three years. Only a minimum application rate of 10 l/m²/min through water turbine-driven foam generators delivering 500:1 expansion ratios and capable of 90% radiation reductions within 60 seconds proved effective under realistic site conditions.



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Angus Tridol ATF medium expansion foam controls LNG fire



Specialist foam equipment

Intense heat emissions from LNG fires means that ordinary high expansion foam equipment is totally unsuitable. It quickly distorts, buckles and ceases to generate any foam. That is why two specially engineered LNG Turbex high expansion foam generators from Angus Fire were used throughout the test programme. The exceptional heat resistance, careful choice of materials and robust design of the LNG Turbex ensures reliable operation even after prolonged exposure to intense cold and searing heat. It has previously passed the NFPA 11:2005 Fire Exposure Test with flying colours, withstanding internal temperatures as high as 1000°C.

Additional features of the LNG Turbex that proved crucial during the tests included a unique water-driven turbine motor, tiered foam-making stainless steel net and special aerofoil fan. These provided a consistent air flow through the foam generator that produced Expandol foam with uniform expansion ratio at all times. Its cocoon-shaped design generated a stable slow-draining foam blanket with uniform bubble size for optimal performance. Stainless steel ducting ensured reliable foam delivery, minimising the adverse effects of wind and performing extremely well under simulated rainstorm conditions.

Foam concentrate

Selection of foam concentrate from the wide range of high expansion foams available is also crucially important. They are known to vary enormously in their effectiveness on LNG. Low quality brands exhibit poor stability as indicated by their faster drainage rates. In contrast, high quality brands like Expandol foam from Angus Fire are known to produce a more stable foam layer for optimal performance and efficiency.

Expandol high expansion foam of around 500:1

expansion ratio was found to achieve rapid fire control and subsequently a controlled burn-off, achieving a 90% reduction in heat radiation in less than one minute. Once control was achieved, the foam application rate was pulsed to maintain full control until all the LNG had burnt away and the spill could be declared over.

System design

The importance of applying these latest findings to the design of LNG fire protection systems cannot be overstated. NFPA 11:2005, for example, suggests that application rates and discharge times should be established by test work on LNG.

Designing a successful system is not limited to using foam generating equipment and concentrates that have been thoroughly tested on LNG. A detailed risk analysis should be carried out early on, and critical variables such as the proportioning system, induction rate, expansion ratio, drainage time and foam depth, as well as application rate and discharge time, should be carefully defined to suit each individual risk. Open path gas monitoring and detection equipment are also important.

Combining all these factors into a properly engineered system to protect an LNG facility is the next challenge. Only a few companies have extensive experience of LNG contracts, and a proven track record of designing specialist LNG systems.

The test programme is continuing this year with additional LNG testing by BP-sponsored PhD students at Texas A&M University. As LNG becomes more prominent in the world's energy supply mix, Angus Fire's latest test data will help emergency responders world wide to prevent and combat LNG fires. Make sure you talk to Angus Fire before finalising your LNG facilities upgrade or new build to obtain a reliable and effective system for when you need it most.

APF

Mike Willson is Product Manager for Foam Concentrates at Angus Fire.

He is responsible for the global marketing of the company's wide range of protein- and synthetic-based range of foams. Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, which provides fire safety and security solutions to more than one million customers around the world.

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Pic courtesy of FSI North America



Mass Decon Techniques and Concerns

By Mark Conron

President and founder
of FSI North America®

Since 9/11 decontamination (decon) procedures have rapidly evolved and developed to deal with potential and anticipated bio chemical attacks on both first responders and citizens.

Early Days

Prior to 9/11 decon consisted largely of 'hoop wands and kiddie pools' used to clean/decon first responders in their chemical suits prior to suit removal. Only nominal thought or planning was normally given to mass victim decontamination from a major incident.

Advances since 9/11

In the last five years or so many advances and changes have occurred.

University degree courses in emergency management are now offered by institutions worldwide ensuring an ongoing infusion of new personnel with fresh ideas and concepts that will continue to evolve and improve Mass Decon in the future.

Planning, training, and sophistication have rapidly progressed on the part of specifying and purchasing authorities to handle potential and anticipated Mass Decon scenarios.

Mass Decon of Thousands

For the Mass Decon of thousands of victims exiting as stadium, large building *et al.* the general

consensus seems to continue to call for the use of two crossed ladder trucks at every or designated exits with master stream nozzles on full fog pattern literally drenching the exiting victims with water and possibly even a foam injected decon solution.

Decon Solutions

Decon Solutions have also evolved and developed over time from simple drenching with water (tepid water between 15-30°C to avoid 'cold shock' strongly recommended), to simple detergents, and specialized foams and liquids with specific uses dependent on the agent requiring decontamination. Such products include but are certainly not limited to stabilized and diluted liquid chlorine dioxides, misted hydrogen peroxide, cold plasma ionization, and simpler hydrocarbon based/derivative/substrate cleaning agents for most industrial type incidents.

Smaller Mass Decon Incidents

For smaller Mass Decon scenarios with victims ranging from 10-250 plus in number that may be at a scene or streaming toward a hospital or major

Pic courtesy of FSI North America



center for care multiple line, four stage (undress/detergent shower – decon solution to be incident dependent/rinse shower/redress) Mass Decon Shower and Shelter Systems have been developed over the past five years.

Such Mass Decon Shower systems may range from one, two, three, four and even five line systems. Each line provides a modicum of privacy during each of the 4 stages of decon and typically certain of the five lines in this case are designated for ambulatory and non-ambulatory men, and women, and other needs as so designated by the on scene co-coordinator.

International Standards Development

While there is at present no standard for these portable decon shower systems offered worldwide by literally dozens of manufacturers there are standards in process. In North America a portable decon shower standard currently designated as ISEA #113 is in final review. When complete this standard will assume an ANSI standard designation. In Europe a standards committee CEN/TC/WG 6 N 037 is also in place developing a standard for at least the Non plumbed-in body showers. The early standards represent an initial attempt to offer a degree of protection to the end

user that products that meet these standards are manufactured by companies committed to this industry.

Mobile Field Hospitals as a Component

While this article is intended to address Mass Decon – the placement of mass numbers of victims or displaced personnel once deconned or after an emergency such as Pandemic Flu or another Katrina Hurricane as in New Orleans – must be addressed as well. This is another e.g. of Mass Casualty and the options here for first responders/hospitals are more or less as follows to increase capacity to handle patient in-flow.

Use an existing and unused building or empty wing of the hospital. This is the simplest option – unless that building is no longer standing or structurally sound.

The options then are to look to the parking lot or field nearby, and employ temporary structures to house patients or provide temporary housing.

Once the decision to purchase temporary shelter systems is made the choice then comes down to either a Quonset hut metal framed structure or a pneumatic shelter system.

If the incident involves for e.g. a Pandemic flue slowly marching across the country – with a few

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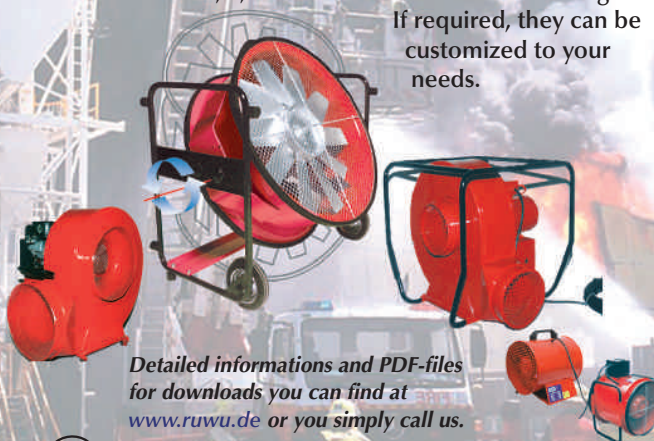
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days to act – then the Quonset hut metal framed systems that require a construction crew, tools, a prepared set up area, and as many as a few days to set up – may well represent the best option. These types of structures once in place can remain so for weeks and indeed months on end.

If, however, the incident is occurring in 'real time' and the victims are seen streaming toward the hospital or other care giving provider with arrival anticipated in mere minutes the only viable alternative is a portable pneumatic surge capacity shelter system that be fully deployed and able to



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Mark Conron is President and founder of FSI North America®, a leading worldwide supplier of portable mobile and fixed hazmat decontamination showers, shelters, isolations shelters, surge capacity shelter systems and accessories, and EMS supplies inclusive of medical cots and disposable backboards. Mr. Conron has spent his entire career in the life safety market and is a member of FEMSA, NEMA, IAHT, and ISEA where he is serving on the ISEA #113 standards committee charged with developing a portable hazmat decon shower standard to be adopted by ANSI.

accept patients in less than 30 minutes. These surge shelter systems require no tools, a limited number of only modestly trained personnel, virtually any location for deployment – and they too can remain in service for literally weeks and even months on end.

Concerns

Concerns are many, not the least of which is still a lack of equipment, old out dated equipment (many products purchased just after 9/11 are now approaching their maximum 5 year anticipated life span), a lack of training, and a sense that an incident 'will never occur here'.

Even for those who possess adequate equipment and feel they are trained to deploy it in the event of a major incident the concerns are or should be many.

If the victims have just started to arrive at the hospital emergency entrance doors how do you recognize their symptoms?

How do you stage victims in shock, panic and fear? How do you get a panicked 'huge and strong' man to patiently wait his turn to be processed into and through a mass casualty decon shower unit? What if he pushes to the front? How do you stop him? Once a person is in a shower system how do you move them along after say 3-5 minutes of showering? What if the person refuses to leave the shower? What if someone collapses in the shower? How do you get to them in a staged mass casualty shower? How do you remove them? What about patient modesty and privacy for both men and women?

If the victims have just started to arrive at the hospital emergency entrance doors how do you recognize their symptoms? How do you stop them from entering and cross contaminating all in the hospital? How do you handle panic?

Concerns – they are many – and only very briefly touched on herein. But they need to be discussed, planned for, and a plan needs to be in place for as many contingencies as possible. **APF**

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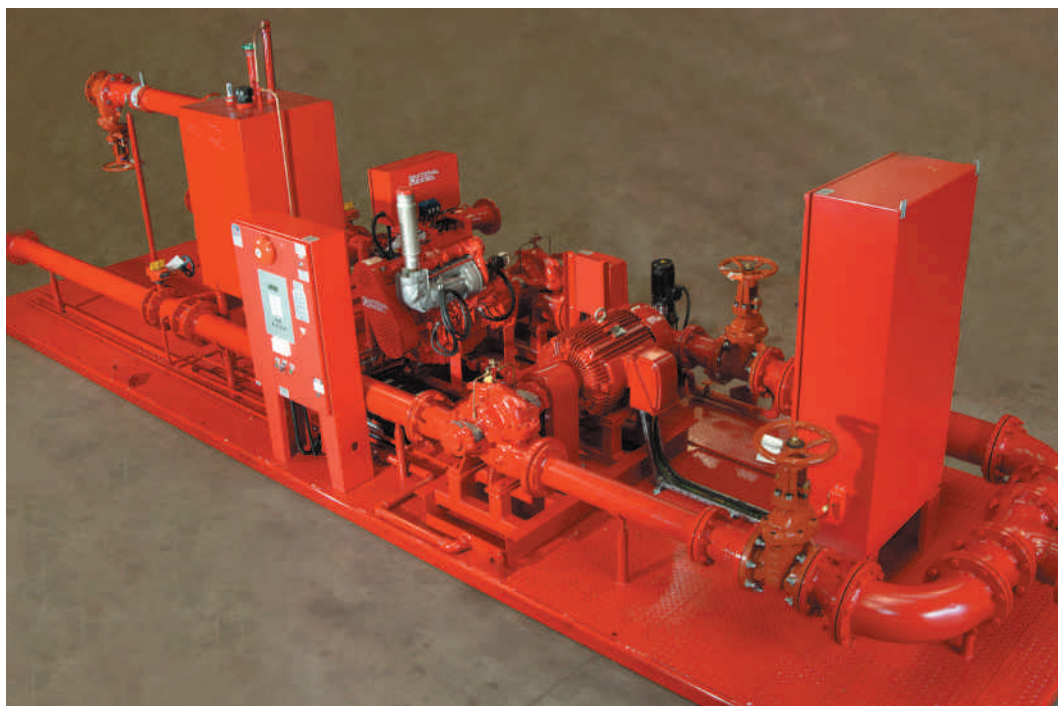
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Fixed Installation Firewater Pump Packages

Internationally, there is a continuing movement towards installing more fixed installation fire sprinkler/hydrant/water-mist/deluge systems into a wider variety of sites ranging from schools and hospitals to shopping centres, manufacturing plants and distribution warehouses. Fixed fire extinguishing installations are a vital component within any overall facility design to protect life and property and their more widespread use provides facility owners with further benefits in terms of risk insurance premium reductions and reduced facility downtime in the event of an incident.

By James Shipman

Sales Manager,
Patterson Pump Ireland
Limited

The capability of the water supply to meet the water flow and pressure requirements for fixed installation extinguishing systems is of paramount importance and is determined by the extinguishing system design. Where this cannot be adequately achieved, it is necessary to incorporate fire pumps within the system.

Globally, there is a vast range of local, regional and international standards in existence for pump system design and selection. For example, within Europe nearly every country currently has its own national sprinkler and fire pump standards although much effort is being applied to introduce a harmonised European Standard EN12259 of which Part 12 will apply to fire pumps. Ultimately, when formally adopted as an EC Directive, the harmonised standards will supersede the current European national standards. However, the

National Fire Protection Association Standard NFPA No. 20 (Standard for the Installation of Stationary Pumps for Fire Protection) has progressively and positively evolved since 1896 and is currently looked upon as the standard which is most widely known and adopted internationally.

In addition to designing and manufacturing to comply with the relevant codes and standards, fire pump producers also commit their products to extensive testing to obtain approvals from recognised organisations such as Factory Mutual (FM), Underwriters Laboratories (UL), Loss Prevention Certification Board (LPCB) Great Britain, VdS Germany, etc. to enable their equipment to be installed and accepted on particular projects. These approvals are the attestation that the manufacturer has complied with the appropriate codes and standards, operates effective quality systems

Pic courtesy of Patterson Pump Ireland Limited



and provides correct product support for their equipment.

Fire pumps can work in a variety of configurations – boosting town mains water pressure directly or from intermediate water storage tanks, either above or below ground. Generally, for above ground water supply applications, 'end suction' or 'horizontal split case' centrifugal pumps are used. Below ground water applications can use an underground storage tank, river or even the open sea as their water source and for these installations 'vertical turbine' or 'submersible' pumps are generally used. Irrespective of the configuration, the final intention is to produce a certain volume of water at a certain pressure – in other words its design duty.

The capacity of the fire pumps required for a particular installation is determined by the extinguishing system design requirements and standards and these can typically range from 550 litres per minute (150 US Gallons per minute) to 19000 litres per minute (5000 US Gallons per minute) at pressures from 2.75 barG (40 psi) to 26 barG (390 psi). Depending on the risk insurer's philosophy, the required system design duty may be provided by a single pump system or may be shared between, say two pumps (known as 50% duty pumps) or more. Frequently, two 100% duty pumps will be installed and each one either designated as 'duty' or 'standby'. All reputable fire pump manufacturers will assist the sprinkler design consultants with determining the optimum pump system selection and specification as required.

Fire pump design and construction is developed around reliable operation. Many fire pump designs available on the market have evolved from manufacturers' proven continuous service process pump designs which have been subsequently adapted for fire pump applications. Although under normal circumstances it may only be run for 30 minutes each week for test purposes, when called on to 'operate in anger' it must start and perform flawlessly and provide firewater to the seat of the incident. This not only means installing and maintaining a reliable fire pump but also its driver, control system and accessories which form part of the overall fire pump package and must be equally as reliable.

Drivers for fire pumps comprise diesel engines, electric motors and steam turbines. Generally, spark-ignition internal combustion engines are not permitted. The popularity of using a diesel engine versus an electric motor as the fire pump driver depends on where you are. In North America it is estimated that 80% of fire pumps are electric motor driven whereas in Europe the converse is true and diesel engines account for 80% of all fire pump drivers. It is true that electric motor driven systems provide for lower overall maintenance and relatively low emissions in a more compact pump room floor area but a diesel engine driven system is virtually independent of

reliability on external power sources.

Selection of the correct driver for the fire pump again depends on the codes and standards the fire pump package is being designed to. Whilst the correct pump speed is fundamental, the driver power rating will need to be sized to accommodate the absorbed power rating of the pump – for some codes this is only at the pump design capacity but for the more rigorous codes it needs to cover pump end of curve performance which demands a considerably higher power rating.

Diesel engine drivers specifically developed for fire pump applications are available. These are usually proprietary well tried and tested brands and models of diesel engines which are then dressed or customised and tested to meet specific codes and approval body requirements. Usually a de-rating factor of 10% is applied to the gross available power when used for fire pump drives but further de-ratings will need to be applied if the engine is installed in ambient temperatures above 25°C (77°F) or 91 metres (300 feet) above sea level to compensate for reduced engine performance. Nearly all codes and standards call for dual redundant battery electric starting systems. This is to ensure reliable starting in the event of one set of batteries failing. Although radiator-cooled engines are permissible, heat exchanger cooling is the usual method with cooling water being taken directly from the discharge of the running pump via the exchanger and returned to waste or to the water storage tank.

Another essential component within the fire



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pump system is the automatic controller. The principle of this is to detect a fall in the firemain water pressure when a sprinkler head ruptures, deluge valve operates or a fire hydrant is opened. This is achieved via a pressure switch or pressure transducer and, when the controller is in 'automatic' mode, initiates the starting sequence and operation of the fire pump. Controllers also provide local manual operation overrides for the automatic starting system as well as remote alarm circuits to enable pump status to be monitored in a permanently manned position such as a gatehouse, reception area, building monitoring system or by the local fire brigade.

Controllers for electric motor fire pumps are relatively straightforward in design and usually employ direct-on-line (across the line) or star delta (wye delta) open transition motor starting techniques. However, when there are mains supply power limitations, more diverse starting methods are available such as a primary resistor, auto-transformer or electronic soft start.

Controllers for diesel engine driven fire pumps are necessarily more complex in nature. Mostly, they will include a cyclic cranking feature to alternate between the dual redundant battery electric starting systems. A crank termination feature is also included to withdraw the starter motor from further cranking once the engine has started. In addition, both battery systems are catered for by fully automatic battery chargers operating from the pump room AC power supply ensuring that they are always in a full state of charge ready for the pump set being called into operation. Engine protective devices are limited but usually engine oil pressure and cooling water temperature are monitored with audiovisual alarms and certain codes require the inclusion of an engine overspeed protection alarm and safety trip circuit.

More and more frequently, fire pump manufacturers are being called on to provide complete pre-packaged fire pump houses. These are fully manufactured at the fire pump manufacturer's facility on a unitary baseplate including all suction

and discharge valving, test lines and are ready to install immediately on delivery to the work-site. They can be supplied with (or without) a pre-fabricated pump house building fully wired out with electrical system, lighting, heating and ventilation system. Smaller capacity units can be fabricated using customised shipping containers. The increasing popularity of the pre-packaged pump house system is without doubt due to the speed and convenience of installation, requiring just fixing to the pre-prepared support base, attaching of suction and discharge lines, electrical supply and the unit is then ready to be commissioned and start its working life. A further major benefit is the elimination of site building costs associated with the construction of a conventional 'bricks and mortar' pump room and its subsequent fitting out costs.

Whilst purchasing and installing any type of fixed extinguishing system is an extremely wise measure in reducing fire risks to life and property and the associated disruption to a business when a fire incident occurs, it is absolutely essential to ensure that the fire pump system is correctly installed and commissioned. Incorrect installation can lead to serious problems later on; for example coupling failure due to incorrect or mis-alignment of the coupling halves. Reputable fire pump system manufacturers will provide local trained engineers to carry out this work to the acceptance of the facility owner and his risk insurer's requirements and also to put into effect the manufacturer's equipment warranties.

Pump system testing should be conducted by the facility owners on a weekly basis and records accurately maintained. Any abnormalities with its operation should be rectified without delay.

It is also imperative that correct regular maintenance is carried out on the system. Most fire pump system manufacturers and risk insurers require equipment to receive servicing and maintenance annually.

Remember – fire pump systems are provided for life-saving and property protection and are not something to fit and forget!

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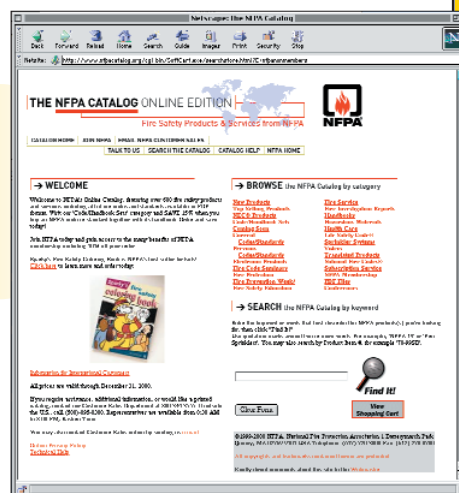
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Tel: +852-23622632

Dealer/Distributor**HONG KONG****CHUBB HONG KONG**

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Dealer/Distributor**INDONESIA****PT DRACO**

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Tel: +62-21-8800058

Dealer/Distributor**KOREA (SOUTH)****YU-IL**

#168 Samsung-Dong
Samsung Bldg Rm 401 Gangnam-Gu
Seoul, Korea
Tel: +011-82-2-565-7121

Dealer/Distributor**PHILIPPINES****PALMER ASIA INC**

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Tel: +632 751 7774

Dealer/Distributor**SINGAPORE****SEALAND RESOURCES**

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Kallang Basin Industrial Est, Singapore
Tel: +65-62968180

Dealer/Distributor**TAIWAN****CHENG AN FIREGUARD IND**

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Dealer/Distributor**DRAEGER SAFETY****CHINA****BEIJING FORTUNE DRAEGER SAFETY EQUIPMENT CO LTD**

Yu An Lu 22, B Area, Beijing Tianzhu Airport
Industrial Zone, Shunyi District, Beijing, 101300
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Fax: +86 10 8049 8005

Email: peter.wang@draeger.com

Dealer/Distributor**INDONESIA****PT DRAEGERINDO JAYA**

Jl. Benda Raya No.54 DEF-Kemang
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Tel: +6221 788 41880
Fax: +6221 781 0230

Email: jakarta.headoffice@draeger.co.id

Dealer/Distributor**JAPAN****DRAEGER SAFETY JAPAN LTD**

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Website: www.draeger.com.sg

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Representative Office**E2V TECHNOLOGIES****INDIA****FOREMOST MARKETING PVT LTD**

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Tel: 00 91-11-261-96982 Fax: 00 91-11-261-66961

Email: foremost@vsnl.net

Website: www.foremostsafety.com

Dealer/Distributor**JAPAN****CORNES DODWELL LTD (OSAKA)**

13-40 Nishihonmachi 1-chome, Nishi-ku
Osaka 550-0005, Japan
Tel: + 81-6-6532-1012 Fax: + 81-6-6532-7749

Email: e-device@cornes-dodwell.co.jp

Website: www.cornes-dodwell.co.jp

Dealer/Distributor**KOREA (SOUTH)****GODO ENGINEERING CO LTD**

1FL. 142-5 Yeonhee-2
Dong Soedaemun-Gu, Seoul, Korea, 120-112
Tel: 822-3141-1236 Fax: 822-3141-1270

Email: info@godoeng.com

Website: www.godoeng.com

Dealer/Distributor**ELKHART BRASS****AUSTRALIA****FIRE RESPONSE PTY LTD**

71 Prince William Dr, P.O. Box 668, Seven Hills
2147, Australia
Tel: +61 2 9838 9071

Dealer/Distributor**INDONESIA****PT REJECKI UTAMA**

Wisma Geha, 5th Floor, JL Timor 25
Jakarta, Indonesia

Tel: +62 21 316 2779

Dealer/Distributor**NEW ZEALAND****PSL PHILLIPS & SMITH LTD**

P.O. Box 69-028
Glendene, Auckland, New Zealand
Tel: +64 9 8184484

Dealer/Distributor**THAILAND****GUARDFIRE LIMITED**

42/2 Teo Hong Bangna Building, Moo 10,
Bangna-Trad Road, Bangkok 10260, Thailand
Tel: +66 2 7467031

Dealer/Distributor**FIRE FIGHTING ENTERPRISES****AUSTRALIA****AMPAC INDUSTRIES PTY LTD**

97 Walters Drive, Osbourne Park
Western Australia 6017
Tel: 00 61 892 423 333 Fax: 00 61 892 423 334

Dealer/Distributor**HONG KONG****HLK SERVICES LTD**

Room 1111, Tower B, Hung Hom Commercial
Centre, 39 Ma Tau Wai Road
Hung Hom, Kowloon, Hong Kong
Tel: 00 852 23303083 Fax: 00 852 23656128

Dealer/Distributor**INDIA****NITIN FIRE PROTECTION INDUSTRIES LTD**

501, Delta, Technology St.
Hiranandani Gardens,
Powai, Mumbai -400 076, India
Tel: 00 91 22 25700392

Fax: 00 91 22 25701110

Dealer/Distributor

KOREA (SOUTH)**HI MAX CO LTD**

Sicox Tower 115-Ho 513-14, Sangdaewon-Dong
Jungwon-Gu, Sungnam-City, Kyungki Do, Korea
Tel: 00 82 31 769 7698
E-Mail: khkim@himax119.co.kr

Dealer/Distributor**MALAYSIA****FITTERS ENG.SERVS SDN BHD**

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Bandar Sri, Damansara, Kuala Lumpur, Malaysia
Tel: 00 60 3 62767155
Fax: 00 60 3 62758712

Dealer/Distributor**NEW ZEALAND****AMPAC INDUSTRIES LIMITED**

P.O. Box 100-149, North Shore Mail Centre
Glenfield, Auckland, New Zealand
Tel: 00 64 94438072
Fax: 00 64 94438073

Dealer/Distributor**SINGAPORE****ACCLAIM SYSTEMS PTE LTD**

Blk 104 Boon Keng Road, 05-01
Singapore 339775
Tel: 00 656 2990 798
Fax: 00 656 299 3735

Dealer/Distributor**ALARM SUPPLY PTE LTD**

63 Jalan Pemimpin
03-07 Pemimpin Industrial Building
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428

Dealer/Distributor**TAIWAN****HORING LIH IND CO LTD**

4F No 18 Lane 327, Chung Shan Road
Sec 2 Chung-Ho-City, Taipei Hsien, Taiwan
Tel: 00886 2224 87599
Fax: 00886 2224 07752
Email: ahtaipei@me26.hinet.net

Dealer/Distributor**THAILAND****F.B. (THAILAND) LTD**

75 Soi Rubia
Sukhumvit 42 Road
Bangkok 10110
Thailand
Tel: 00 66 2 3902445
Fax: 00 66 2 3811197

Dealer/Distributor**TEEYA MASTER SYSTS CO LTD**

100/101-102 Vongvanji, Building B, 30Th Flr,
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
Tel: 00 662 2 6451130
Fax: 00 662 2 2488540

Dealer/Distributor**HELMET INTEGRATED SYSTEMS****AUSTRALIA****CHUBB FIRE AUSTRALIA**

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NSW 2118, Australia
Tel: +61 2 8748 7440
Email: Graham_Harris@chubb.com.au

Dealer/Distributor**BRUNEI****GLAMCO AVIATION (B) SDN BHD**

GPO Box 2793
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Email: shran@brunet.bn

Dealer/Distributor**CHINA****WUXI FIRETRE SAFETECH**

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WUXI, Jiangsu Province 214021
People's Republic of China
Tel: +86 510 275 3771
Email: gao@pub.wx.jsinfo.net

Dealer/Distributor**HONG KONG****SAFETECH LIMITED**

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Wah Lock Industrial Centre, Shan Mai Street
Fo Tan Shatin, New Territories, Hong Kong

Dealer/Distributor**INDIA****VIJAY SABRE SAFETY PVT LTD**

Plot 35 Chandivali Village, Off Saki Vihar Rd
Mumbai 400 072, India
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Email: vijaysabre@vsnl.net

Dealer/Distributor**INDONESIA****PT BUMI CERAH AGUNG**

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Jl Karang Anyar No 55 /C1-17
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Email: rudybca@centrin.net.id

Dealer/Distributor**KOREA (SOUTH)****JIN-ASIA CORPORATION**

889-3 Daedae-Ri, Unghon Myun
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Dealer/Distributor**MALAYSIA****DASAPREM (M) SDN BHD**

10 & 12 Jalan Muara 8/9
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Darul Ehsan, Malaysia
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Email: dasaprem@dasaprem.com

Dealer/Distributor**NEW ZEALAND****CHUBB FIRE & SAFETY PRODUCTS**

3 Fisher Crescent, Mt Wellington
Private Bag 9220, Auckland, New Zealand
Tel: +64 9 270 7234
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Dealer/Distributor**SINGAPORE****PROGRESSIVE INDUSTRIAL EQUIPMENT COMPANY**

24 New Industrial Rd, #02-08 Pei Fu Building
Singapore 536210
Tel: +65 6282 7722
Email: pie@pacific.net.sg

Dealer/Distributor**PHILIPPINES****ALLIANCE INDUSTRIAL SALES**

Unit 109, Cluster 3, Makati Prime City
7708 St Paul Road San Antonio
1203 Makati City, Philippines
Tel: +632 890 8818

Email: alliance8_jcy@pacific.net.ph

Dealer/Distributor**TAIWAN****SECOROC CORPORATION**

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Email: secoroc@ms21.hinet.net

Dealer/Distributor**THAILAND****CHASE ENTERPRISE (SIAM) CO LTD**

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Tel: +66 2 883 2880
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Dealer/Distributor**KERR****AUSTRALIA****FIRE RESPONSE PTY LTD**

PO Box 668, New South Wales 1730,
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Contact: Geoff Marchant
Tel: 0061 02 9838 9044 Fax: 0061 02 9838 9071
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Dealer/Distributor**HONG KONG****ON MAN SAFETY EQUIPMENT CO**

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444-452 Des Voeux Road, West Hong Kong
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Dealer/Distributor**INDIA****NITIN FIRE PROTECTION INDUSTRIES LIMITED**

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Dealer/Distributor**MALAYSIA****DASAPREM (M) SDN BHD**

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Tel: 00603 5510 0957 Fax: 00603 5510 4486
Email: dasaprem@yahoo.com
Website: www.dasaprem.com

Dealer/Distributor**NEW ZEALAND****PSL**

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Email: anne@firemaster.co.nz

Dealer/Distributor**THAILAND****THE EAST ASIATIC (THAILAND) PUBLIC CO LTD – EAC**

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Email: patcharaporn@eac.co.th

Dealer/Distributor**KIDDE FIRE PROTECTION****AUSTRALIA****KIDDE AUSTRALIA PTY LTD**

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314 Boundary Road, Dingley Vic 3172
Mailing Address:
PO Box 682, Braeside Vic 3195
FreeCall (Australia): 1800 672 171
Tel: 03 9518 5588 Fax: 03 9518 5577
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Representative Office

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Representative Office**L&W COMPRESSORS****AUSTRALIA****SATSIM DIVING & TRAINING**

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Mobile: + 61 (0)415 610 934
Email: chris@satsim.com.au
Website: www.satsim.com.au

Dealer/Distributor**BANGLADESH****ENGINEERING & ARCHITECTURAL CONSULTANTS LTD**

10 Dilkusha c/a, Jibon Bima Tower (8th floor)
Dhaka 1000, Bangladesh
Tel: +880 2-956 1610 Fax: +880 2-956 1606
Email: eac@bdmail.net

Dealer/Distributor**CHINA & HONG KONG****L&W COMPRESSORS + SYSTEMS PTE LTD IN CHINA**

Room 902, Building #6 Huirun Yuan, Tong Hui Jia Yuan
Gao Bei Dian Xiang, Chao Yang District, 100025
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Cell: +(86)1314-128-1608
Email: nathan@lw.com.sg

Representative Office**HONG KONG****OCEAN PROFIT LTD**

G/F, 104A, Fook Wah St.
Sham Shui Po, Kowloon, Hong Kong
Tel: +852 2708 1337
Fax: +852 2725 9270
Email: charles@kikoo.com.hk

Dealer/Distributor**INDIA****CORE ENERGY SYSTEMS PVT LTD**

Plot X/16 – 1 & 2, Prathmesh Vyapari Sankul,
MIDC Residential Zone, Dombivli (E) – 421 203
Maharashtra
Tel: +91 251 2444 800 / 01
Fax: + 91 251 2444 804
Mobile: 92235 93442
Email: Ashish@core.co.in

Dealer/Distributor**INDONESIA****LAUTAN MAS**

Jl. Toko Tiga No.24
11230 Jakarta-Barat
Tel: +62 21 690 1333
Fax: +62 21 690 2479
Email: Office@lautanmas.com

Dealer/Distributor**KOREA****HYSINE TRADING**

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102-2704 Haeundae-gu Jaesong 1-dong
Busan, Korea
PO Box 612-712
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Fax: +8251-988 3017
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Dealer/Distributor**MALAYSIA****SPECTRON SERVICES SDN BHD**

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Jalan Imbi, 55200 Kuala Lumpur
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Tel: +603 4257 3837
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Dealer/Distributor**DRAEGER SAFETY ASIA PTE LTD**

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Dealer/Distributor

SINERGI IKRAM (M) SDN BHD

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Tel: +603 8068 3929 Fax: +603 8068 2091
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Dealer/Distributor

SABAH DIVERS

Lot 27, Ground Floor
Wisma Sabah
Jalan Haji Saman
88000 Kota Kinabalu, Sabah, Malaysia
Tel/Fax: 6088 256 483
Dealer/Distributor

PAKISTAN**MODERN MOTORS (PVT) LTD**

Beaumont Road
Modern Motors House PO Box 8505
Karachi 75530, Pakistan
Contact: Mr. Asif Chaudhri
Tel: 9221-568 0347 Fax: 9221-568 0903
Email: mmlparts@cyber.net.pk
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PAPUA NEW GUINEA**DIVECENTRE**

Contact: John Miller
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PHILIPPINES**ASIA DIVERS**

PADI 5 Star CDC centre
El Galleon Beach Resort
Abimir Place, 1741 Dian Street
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Tel: +632 834 2974 Fax: +632 287 3205
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Email: tommy@asiadivers.com
Website: www.asiadivers.com
Dealer/Distributor

SRI LANKA**LSR LANKA SPORTREIZEN**

29 B, S.DE. S. Jayasinghe mawatha
Kalubowila, Dehiwela, Sri Lanka
Tel: +94 11 282 4500, 2824955
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Email: lsr@sri.lanka.net
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TAIWAN**FIREWOLF**

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Website: www.firewolf.com.tw
Dealer/Distributor

FULGENT SCIENTIFIC INC

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THAILAND**DIVE MASTER CO LTD**

16 Asoke Court, Sukumvit 21 Road
Wattana, 10110 Bangkok, Thailand
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Email: info@divemaster.net
Dealer/Distributor

DIVE SUPPLY CO LTD

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Email: info@diveupply.com
Website: www.diveupply.com
Dealer/Distributor

VIETNAM**LOADCELL SERVICES PTE LTD**

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Dealer/Distributor

MSA**AUSTRALIA****MSA (AUSTRALIA) PTY LTD**

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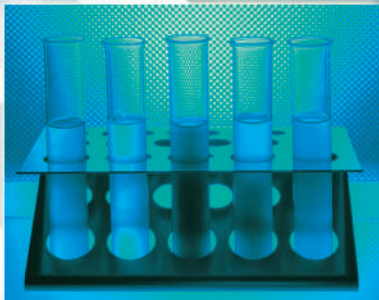
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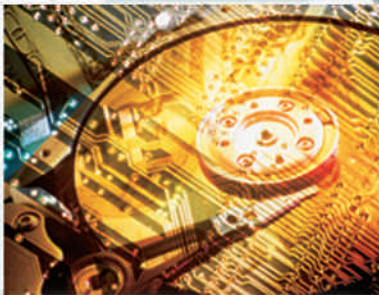
Amkus Inc	49
Ansul, Inc.	OBC
Avon Protection	39
Bauer Compressors Asia Pte Ltd.	39
Bio-Ex	55
Bristol Uniforms Ltd.	57
BW Technologies by Honeywell	43
Chemetron Fire Systems	IBC
Dafo Fomtec	27
Draeger Safety Asia Pte Ltd.	40
Dr. Sthamer Hamburg	65
Du Pont FE	04
Du Pont Surface Protection Solutions	25
E2V Technologies	33
Elkhart Brass Mfg Co Inc	69
FDIC Bahrain	17
Fire Fighting Enterprises	55
Fire & Rescue Asia 2007	09
GB Solo Ltd.	28
Helmet Integrated Systems Ltd.	27
Holmatro Rescue Equipment	50
Honeywell Fire Systems	64
ISG Thermal Systems	30
Iveco Magirus Brandschutztechnik GmbH	06
Kidde Fire Protection	52
Lancier Hydraulik Co. KG	48
L&W Compressors + Systems Pte Ltd.	37
MSA	34
NFPA	71
Nittan UK Ltd.	66
PBI Performance Products	13
Plastika Akrapovic	60
PPS Ltd.	63
Resqtec Zumro Asia Sdn Bhd	51
Russwurm Ventilatoren GmbH	63
Sage Technologies Ltd.	31
Sicor Spa	45
Solberg Scandinavian	27
Task Force Tips, Inc.	IFC
Texas A & M Emergency Services Training Institute	56
Tyco Safety Products – Hygood	18
Tyco Safety Products – Skum	22
Unifire Power Blowers	46
Vetrotech Saint Gobain International AG	59
Wolf Safety Lamp Company	63



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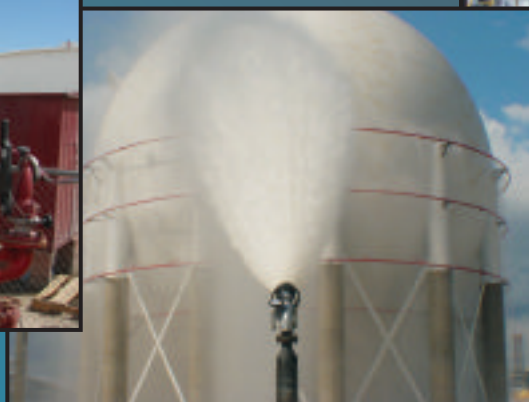
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**December 2007
Issue 24**



Front Cover Picture: New Zealand Dept of Conservation Fire Fighter sent to help with a Bush Fire in Victoria, Australia in late 2006. Picture courtesy of Pacific Helmets (NZ) Ltd.

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Contents



15-19



21-28



39-42



45-48

05 NFPA Foreword

**07-13 News &
Product Profiles**

**15-19 Fire Fighting
Helmet Standards are
a-changing. But are
they changing fast
enough?**

**21-28 Testing Fire
Fighting Foam in
Marine Applications**

**31-36 Treating
NFPA 99**

**39-42 Not All
Hazards are the same:
Design Considerations
for matching Flame
and Gas Hazards to
Detector Technologies**

**45-48 Large Fires
Require Large Water
and Foam Flows**

**50-52 Specifying
Fire Alarm Systems**

**55-57 Taking a
Modular Approach to
SCBA**

**59-62 Heavy
Vehicle RTAs**

**64-68 Use of
Simulation for ARFF
Crash Truck Driving &
Operations**

**69-71 Sprinklers in
Warehouses**

**72-79 Distributor &
Representative Office
Listing**

80 Advertisers' Index



50-52



55-57



64-68



69-71



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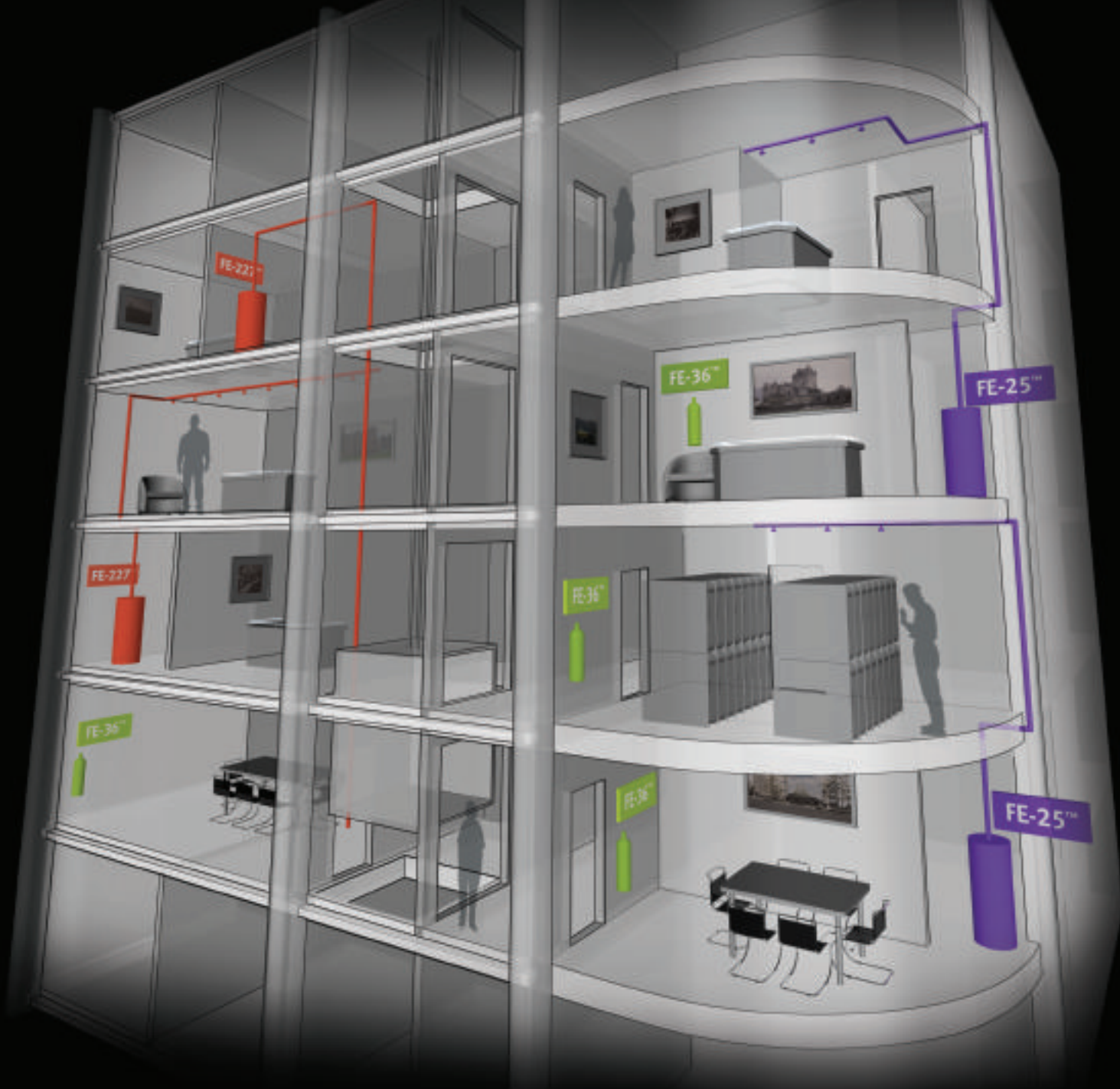
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By Olga Caledonia

Executive Director
International
Operations, NFPA

Foreword

NFPA 1600 and the Role of Partnerships

Recent international disasters, whether natural or manmade, have increased the interest in using or adopting *NFPA 1600, Standard on Emergency Management and Business Continuity Programs*. NFPA 1600 has proven to be a widely used international document across regions. Today there is an international acknowledgment that efforts to reduce hazards and disaster risk must be systematically integrated into national policies and projects. These efforts must be supported through bilateral, regional and international cooperation, including *partnerships*.

Last August in Beijing NFPA participated as a principal member of the steering committee on the *First China – U.S Conference on Disaster Management*. The conference sponsors were the China Association for Disaster Prevention and the China International Conference Center for Science and Technology based in Beijing; and Global Interactions, Inc. from the United States. One of the key objectives of the conference was to develop partnerships between individuals, institutions, and agencies to continue the dialogue and exchange and to create sustainable relationships that will impact the field of disaster management worldwide. The two-day technical presentations ranged from earthquake research to academic programs to naturally fire-resistant trees used as a fire break. “The conference was assessed to be very successful and the representatives from the PRC have expressed an interest in a continuing series of conferences on disaster management” notes Dean R. Larson, NFPA 1600 Committee member and also member of the steering committee. A few weeks before that, in late June NFPA held a 1600 conference workshop in Buenos Aires, Argentina in partnership with the local standard developer, IRAM. The one day conference brought together 1,800 industry professionals from Argentina and nearby countries. These are examples of recent NFPA activities to accelerate the exchange of best practices and lay emphasis on the importance of partnerships.

Developed with input from such public and private-sector organizations as the Federal Emergency Management Agency, the National Emergency Management Association, and the International Association of Emergency Managers, NFPA 1600 is the only existing process-based national or international standard that identifies key functional areas and an overall strategy for disaster preparedness and business continuity for both private and public-sector organizations. It takes a “total program approach” to disaster and emergency management and business continuity

by providing common elements, techniques, and processes that can serve as a general strategic-level guide in the development of an overall program. NFPA 1600 provides guidance that cities and towns can use to develop their own disaster programs, allowing them to coordinate and manage their resources when preparing for, responding to, and recovering from large-scale emergencies and disasters. Given the vast difference among various types of industries and organizations, more detailed plans and operational-level policies and procedures are best developed on a company-by-company basis.

The standard (available for free downloading from NFPA's Website) is a significant global resource for private-sector preparedness, worthy of greater communication and use. It has also been translated into Spanish, French, Chinese, Japanese and Korean.

It is time to face the fact that events like terrorist attacks and historic natural disasters happen. And, the preparation we have done to face those events or even the more routine events that we rely on our fire departments to handle, translate directly into lives saved. At NFPA, we will continue our work at the local, national and international levels to make sure that the needs of fire departments and/or emergency responders are understood by public officials and the public itself. Disasters often cause the reexamination of programs and processes that are intended to ensure survival. The most current 2007 edition of NFPA 1600 reflects a reexamination of disaster and emergency management programs and as a result, Prevention was “added” as a separate core element. For preventive interventions to be effective, risk assessment must be employed to identify those hazards which could and should be prevented. We invite you to take a look at the NFPA 1600 document <http://www.nfpa.org/assets/files/PDF/NFPA1600.pdf> and share with the appropriate private or public entities which might benefit from a document used and recognized worldwide.

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Fire fighting helmets and thermal imaging cameras

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The SOLOvision **S2** can be used as a hands-free unit or it can be hung over the neck like a pair of binoculars using the neck strap. It is the lightest and smallest thermal imaging camera in the World. It is suitable for use with all known breathing apparatus and gas masks. As an all round camera with the capability to monitor for fire / search and rescue of victims, there is no better camera for the job.



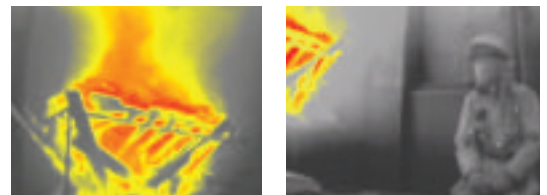
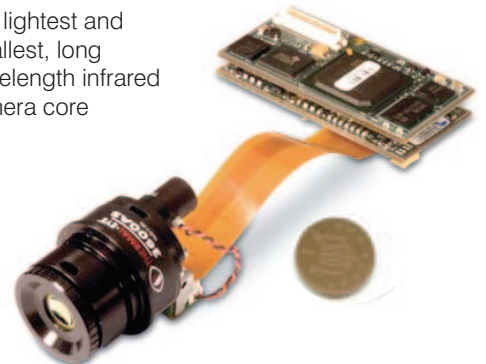
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For a better overview



DRÄGER presents a new generation of internally-developed thermal imaging cameras at the A+A 2007: The Dräger UCF® 1600 and the high resolution Dräger UCF® 3200. The Dräger UCF 1600 has a picture resolution of 160 pixels x 120 pixels. The Dräger UCF 3200 has a high resolution of 320 pixels x 240 pixels and simplifies documentation and analysis of hazardous situations.

Applications for thermal imaging cameras is many-sided including use in firefighting, orientation in darkness or in smoky rooms, finding people, accidents with hazardous materials or for the searching for blind passengers in cargo bays. The sensor technology of a thermal imaging camera makes the thermal radiation of a person or an object visible. It is displayed graphically on the camera screen. The major advantage is the possibility to localize people and objects clearly without the hindrances from external influences such as thick smoke or darkness. Thermal imaging cameras can deliver clear images where normal cameras or night vision devices fail.

Dräger UCF 1600 and Dräger UCF 3200 use a digital 2x zoom to double size picture selection. Another standard feature is the five predefined color palettes, which enable the optimal viewing of the thermographic images. The rechargeable lithium ion battery ensures uninterrupted operation for more than four hours. An innovative battery management system displays the remaining capacity of the rechargeable battery linearly – similar to a fuel gauge.

New thermal imaging camera from Dräger

The optionally integrated ThermalScan function provides an adjustable, temperature-dependent display of the operational area. Areas with a higher temperature will be displayed in yellow when selected by the user.

The camera can be modularly upgraded with easy-to-install-handles. The selection consists of a purely mechanical carrying hold, one for the wireless image transfer to the receiving terminal and one for the saving of images and movies.

Drägerwerk AG is an international leader in the fields of medical and safety technology. Dräger products protect, support and save human life. Founded in 1889, in 2006 the Group achieved sales of €1,801 million worldwide and an EBIT of €148.2 million. Today, Dräger employs around 10,000 people in more than 40 subsidiaries worldwide and has a representation around 190 countries. The Dräger Safety division offers products, services and system solutions for all encompassing Risk Management such as Personal- and Facility Protection.

For more information, visit www.draeger.com

For further information please contact:
Draeger Safety Asia Pte Ltd
Email: justin.kung@draeger.com
Website: www.draeger.com.sg

AMKUS Debuts NEW AMK-30CRT Spreader at Fire-Rescue International in Atlanta

AMKUS Rescue Systems (Downers Grove, IL USA) is proud to introduce their NEW AMK-30CRT Spreader based on their legendary field-proven AMK-30CX spreader. It incorporates the innovative push-button removable tip design that has made the AMK-24 spreader one of the most successful product launches in AMKUS' 30+ year history. With the addition of the optional extended reach tips (part # 391000001010) the AMK-30CRT creates an amazing 40 inches of spread.

The AMK-30CRT is sold either as a completely new unit or as an upgrade package for current owners of the original AMK-30CX. The upgrade package includes new arms and tips at a specially discounted price. Extended reach tips are available as optional equipment for both the AMK-24 and the AMK-30CRT spreaders.

AMKUS also manufactures a complete line of high performance hydraulic rescue tools and extrication equipment including: spreaders, cutters, combination tools, rams, power units and the innovative ARRS Rope Rescue system.



For more information, please contact:
AMKUS Rescue Systems
Email: experts@amkus.com
Website: www.amkus.com

Haztec Launch the XSC The Ultimate LED Directional Warning Lights ?!!!

Each large XSC LED Module features a total of 12 latest Generation 3 UHP LED's angled within the convex optic lens to give 180 Degree coverage producing a vivid front and side warning signal. Although ideal for all types of Emergency Vehicles XSC is particularly good for mounting on the front sides and rear of Fire Vehicles. The advanced light gathering optics produce a superior high intensity warning signal.

The led modules are available in Blue, Red, Amber Green and White. The external polycarbonate lense in Clear, Blue, Red or Amber and the Cast Alloy Surface Mount and Bumper Housings in White or Black.

XSC are powered by a remote mount 10-40 Volt Operation Flasher Control with switchable outputs. The control also has Selectable Flash patterns and Steady-On Cruise Light Option at 10% of light output.



For more information, please contact:
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Email: Info@Haztec.biz

New Cromwell Fire Helmet Performs Dual Role

Operational demands on the Fire and Rescue Services have changed dramatically over the past decade, raising the need to provide increased levels of protection and comfort for personnel involved in fire and rescue operations.

In the case of helmets it is generally accepted that less than a third of all 'call outs' to the Fire and Rescue Services require the need for a structural fire fighting helmet. Other incidents not requiring this type of helmet include road traffic accidents, woodland fire fighting, water rescue, urban search and rescue and industrial incidents such as confined space rescue operations.

To meet these requirements, HELMET INTEGRATED SYSTEMS LTD (HISL) has developed the Cromwell dual helmet system featuring two helmet shells that can be integrated into one.

The base helmet, the Cromwell ER1, is designed for emergency and rescue operations that do not require a structural fire-fighting helmet, making it also suitable for use by paramedic, water



rescue and civil defence personnel. The helmet has an integral internal visor, and can be fitted with accessories such as ear defenders and a full faceshield. In

The Cromwell FR2 Structural Fire Fighting Helmet

addition, the helmet can be configured for specialised applications such as heli-deck, coastguard, air sea rescue and public security operations.

The Cromwell FR2 with an integral full face shield, has an internal clip arrangement enabling it to be fitted to the ER1 base helmet in seconds, providing additional heat, flame and impact protection to the wearer when undertaking structural fire fighting operations. The FR2 can also be fitted with integral communications, neck capes and SCABA facemask fixing points.

The Cromwell helmet is manufactured using the latest moulding techniques and materials, and was designed with reference to international anthropometrical data relating to male and female emergency personnel across arrange of ethnic groups, establishing that the helmet is suitable for international use.

HISL, the Hertfordshire UK based, ISO 9001 approved manufacturer of the new Cromwell helmet, supplies many of the UK Fire Services with its Cromwell F500 and F600 fire helmets and is the leading international supplier of aircrew helmets for military and commercial aircraft.

HISL is able to offer sample helmets for evaluation and trial to interested fire and emergency service users.

For more information, please contact:
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Fire Product Search proves to be a big hit!

FIRE PRODUCT SEARCH, the next generation of product guide, has proved a huge success since launching earlier this year. Based on actual fire products, the Fire Product Search website allows users to make the right choice when specifying fire equipment by providing up to date detailed information.

Fire Product Search features hundreds of the world's leading fire equipment manufacturers giving users a huge choice when searching for fire products. Updated constantly it provides reliable information at the click of a button.

Fire Product Search goes one step further! Rather than list fire product categories Fire Products Search features detailed product descriptions, pictures and technical specifications plus full information on manufacturers and their distributor networks.

Still flicking through bulky buyers guides? Fire Product Search has been specially designed to make searching for products a quick and enjoyable experience. Visitors can browse through



categories, search using keywords or by company with ease. A FREE monthly e-newsletter, information on the latest global fire conferences and exhibitions plus industry news can also be found at www.fireproductsearch.com

Join over 15,000 visitors at www.fireproductsearch.com, we look forward to seeing you.

Companies can register with Fire Product Search for FREE, for more information visit www.fireproductsearch.com

Chubb PEFS Fire Protection System

The first to be compliant with new standards

The new Australian Standard, AS 5062 "Fire protection for mobile and transportable equipment" has raised the bar for fire protection systems used on heavy machinery. The result of four years of development originating from the needs of the mining industry, AS 5062 provides a nationally consistent and sound approach to the design, installation and operation of fire protection systems used on mobile equipment in Australia.

Chubb Fire Safety is committed to meeting the highest industry standards and is proud to be the first manufacturer to have its PEFS (Pre-Engineered Foam Spray) fire suppression system independently assessed for compliance to the requirements of AS 5062. Chubb's PEFS system has been assessed by CSIRO and is the first AS 5062 compliant fire protection system listed on CSIRO's ActivFire Register of Fire Protection Equipment.

Whilst developed specifically with the mining industry in mind, AS 5062 is also applicable to mobile plant and vehicles used in a wide range of industries. This could include the forestry, construction, rail and agricultural industries where equipment typically operates in harsh environments and maybe subject to severe shock and vibration. AS 5062 incorporates rigorous component testing criteria to ensure fire systems are "fit for purpose" for use in the harsh environments in which they are required to operate.

In addition, as fires on large mining vehicles can spread rapidly, potentially endangering life, resulting in loss of high value capital equipment and causing severe business interruption, fire systems must not only be "fit for purpose" in terms of component durability but also in terms of suppressing the extremely challenging fires which are typically encountered. As a result, challenging fire testing protocols are included in AS 5062 to prove fire system performance.

Chubb's PEFS system achieves impressive fire suppression capabilities through the combination of foam discharged in the form of a finely atomized spray. Strategically positioned nozzles direct the high velocity foam spray and provide "three dimensional" fire fighting properties, allowing the system to suppress pressure fires that may occur as a result of a ruptured fuel or hydraulic line. The fine droplets of foam are extremely efficient at absorbing large amounts of heat before turning to steam, which further enhances the three dimensional fire fighting properties of the system. Once discharged, the foam is effective in suppressing spill or pool fires which may result from the collection or leakage of fuel. The resulting foam blanket provides post fire securement.

A number of significant product improvements have been incorporated in Chubb's PEFS system to comply with the requirements of AS 5062, including the VS Control System. The VS Control System is an electronic detection and control system which interfaces with the fire suppression system and the machine being protected. The VS control system provides system status and fault monitoring and can be configured to control suppression system activation, provide auxiliary alarm outputs and equipment shutdown functions. The VS control system incorporates battery back-up in case of loss of primary



power and all detection and actuation circuitry is monitored for faults.

PEFS systems can be configured for manual and automatic actuation, and supports multiple detection options to suite specific applications. Detection options include Loss of Pressure (LOP) or Rise of Pressure (ROP) pneumatic detection and/or Linear Heat Detection (LHD) cable.

In addition to proving fire systems are fit for purpose, another prime objective of AS 5062 is to formalise good practice and provide a consistent approach to the fire risk reduction techniques used to safeguard life, property and the environment from fire on mobile equipment. AS 5062 includes requirements covering the design, installation, commissioning, and maintenance of fire protection systems by competent personnel.

Chubb's system technicians are trained to a nationally endorsed competency specifically covering installation, inspection, testing and maintenance of pre-engineered fire systems for transportable equipment. This competency forms part of the nationally recognised qualification – Certificate III in Asset Maintenance.

Chubb has been supplying and installing PEFS systems for over 20 years and has fostered close relationships with original equipment manufacturers with a view to continuously improve its PEFS product and service offering. This commitment to continuous improvement is evident in the AS 5062 compliant PEFS system.

Chubb Australasia became part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, in July 2003. UTC Fire & Security employs more than 43,000 people in 25 countries and owns the Chubb and Kidde brands.

UTC Fire & Security leads the world in special-hazard fire and explosion suppression systems for land-based, vehicle and marine applications. It has extensive research and development facilities in the UK and United States, and its state-of-the-art delivery systems utilise a broad array of extinguishing agents.

APF

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Fax: +61 (2) 8748 7450
Website: www.chubb.com.au

Holmatro® Duo Pump DPU 31 PC: light AND quiet

The DPU 31 PC Duo Pump – Personal Power® has been developed to meet the demand for a light and silent duo pump for the simultaneous operation of two rescue tools.

With a weight of only 25 kg and an excellent centre of gravity the DPU 31 PC Duo Pump can easily be carried by one person only. Most countries' occupational health and safety regulations state that one person is not allowed to carry objects heavier than 25 kg.

Another important feature is the low noise level of 68 dB at 1 m distance. This is more comfortable for the victim. It also provides a better workplace for the rescuer because it is easier to communicate at the rescue scene. The pump has an eco mode switch: when connected tools are not used, the engine automatically switches to eco mode for a very low noise level and fuel consumption.

The DPU 31 PC Duo Pump has LED



lighting above the valve block which allows for easy identification of the pump location in the dark. Furthermore, it facilitates coupling and uncoupling of the hoses.

The pump is also equipped with gauges at the front for easy checking of oil and petrol levels.

The hydraulic oil contents of 2490cc is sufficient to operate two rescue tools at the same time.

What makes the DPU 31 PC Duo Pump really unique is that it is the first Holmatro® duo pump that is standard equipped with Holmatro's revolutionary CORE™

Technology. This technology is a turning point in *speed, ease and safety* of operating hydraulic rescue tools. For the DPU 31 PC Duo Pump and other duo pumps equipped with CORE™ Technology this means that you only need two hoses instead of four to connect two tools to the pump. Every connection of a hose to a pump and tool means 2 times coupling instead of 4, and 2 times clicking dust caps together instead of 4. With a duo pump this means a saving of 8 times 'coupling and clicking'!

A traditional rescue system requires the rescuer to switch the pump (valve) to neutral before changing (disconnecting and connecting) the rescue tool is possible. A CORE™ system allows the rescuer to change the tool while the hose is 'under flow'; the pump is running and the valve is always selected. It is no longer necessary to change the tool at the pump. On the contrary, the rescuer can change his tool any time, whenever the circumstances require and without delay, even without releasing pressure at the pump. Working with CORE™ increases the rescuer's flexibility, saves time and is much easier to handle.

For more information, please contact:
Holmatro Rescue Equipment
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Email: info@holmatro.com



Underwriters Laboratories Inc. has evaluated and listed their first motorised beam detector as compliant with the American National Standards for safety. The Fireray 5000 from FIRE FIGHTING ENTERPRISES now boasts certification from UL in addition to LPCB, CPD & EN54:12,

First UL Certification for Motorised Beam Detector

breaking new ground in the development of this smoke detection technology.

The F5000 incorporates several technological advancements that set it apart from previous detectors. A newly-developed motorised beam head works in conjunction with the sensor to automatically optimise the signal strength throughout the life of the unit. This works to keep the beam aligned with the reflective prism even in the event of gradual building shift, and can also factor in environmental factors such as dust buildup. These features strengthen false alarm immunity over time, and help to reduce the need for maintenance operations.

These new additions for the F5000 improve its functionality, whilst it retains the benefits intrinsic to the tried, tested and trusted beam technology that has preceded it: large area coverage per unit (~19800 sq ft as opposed to ~900 sq ft for a point type detector), reduced cabling and installation costs, and minimal

aesthetic intrusion.

The Fireray's low-level system controller is connected to the detector head by a two-wire cable, and can be used to fully control and adjust the beam – making installation significantly easier. The detector head houses both the transmitter and receiver, with the beam being bounced off a prismatic reflector on the opposite wall. Beam-type detectors are particularly suited to protecting wide indoor spaces such as warehouses, open-plan offices, corridors and meeting-halls. By covering large areas with few units, costs and disruptions caused by installation and maintenance can be greatly reduced, and the fire security system can be much less obtrusive – which can be of particular benefit in historic or stylish settings.

For more information, please contact:
Fire Fighting Enterprises
Email: sales@ffeuk.com
Website: www.ffeuk.com

Optimized wear comfort coupled with maximum protection

The new DS 6200 integral firefighter's helmet launched by Dräger conforms to the new standard prEN 443:2007 and is the lightest helmet currently on the market which is approved to this standard. The helmet was developed in collaboration with customers, as an improved version of the already proven HPS 6100 firefighter's helmet. Special manufacturing and paint coating techniques ensure that the high-temperature-resistant duroplastic helmet shell is capable of withstanding even the most intense heat, while offering maximum protection against penetration and impact, not to mention robustness and paint adhesion, even under the influence of extreme levels of heat.

Integrated face protection

The new visor, which has been extended down to the chin area (approved in accordance with EN 14458 and classified as face protection), is made of especially robust polysulfone material, amber tinted (allowing wearers to maintain visual contact even with their visors pulled down) and provided with an anti-scratch coating on both sides. Tabs simplify opening and closing of the visor, even when wearing thick firefighting gloves.

A new integrated flame and heat barrier creates a better climate inside the helmet. Modified protective padding in the ear area achieves improved wear comfort and greater acoustic sensitivity.

Connection systems allow the HPS 6200 to be used in combination with the newly developed FPS 7000 full face mask or the Panorama Nova-S or F2-S respirator masks.

New helmet standards

At the present time, European Committee for Standardization working group 3 for firefighters helmets (CEN/TC158/WG3) is working flat out to draw up the new helmet standard EN 443. Dräger is providing its support to this project: among other things, the most recent meeting of the working group took place in Lübeck at the invitation of Dräger Safety. The goal is to submit the current



draft standard for a formal European vote in the summer of 2007 and for the standard to enter into force towards the end of 2007. In contrast to the currently valid version of the standard, which is EN 443 from 1997, the new standard distinguishes between two types of helmet – half-shell and integral helmets. The requirements and testing procedures have been significantly extended, partly to reflect the latest knowledge about material properties and production technologies, and partly with the aim of re-evaluating the risk analysis and taking the practical experience of fire brigades into account. For one thing, this will lead to harmonization with respect to the protection afforded by the other personal protective equipment used by firefighters (such as compressed air breathing apparatus and fire protective clothing). On the other hand, it reflects the significantly increased potential risk faced by firefighters.

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ETC Awarded Contract to Deliver Disaster Management Simulator to Hong Kong Fire Service

ADMS-COMMAND at Second Major Asian Fire Services Institution

ENVIRONMENTAL TECTONICS CORPORATION's Simulation Division today announced the signing of a contract with the Hong Kong Fire Services Department (HKFSD) to deliver a multi-station ADMS-COMMAND, the next-generation Advanced Disaster Management Simulator training system. The contract includes three open-ended, dynamic scenarios within a regionalized virtual environment. The scenarios include a multi-vehicle highway traffic accident, a B-747 crash-landed in a residential area and a high-rise apartment building fire. The scenarios can be changed to fit various training objectives. The system will also include regionalized response vehicles. The HKFSD employs a force of over 9,000 firefighters who serve one of the most densely populated urban areas in the world. To be delivered by the end of the year, HKFSD's ADMS system will allow responders to train safely and realistically. ADMS President, Marco van Wijngaarden commented, "We are proud to be working with the Hong Kong Fire Services Department. This order marks the second ADMS system to be purchased by a world-class Asian fire services institution, following the delivery of a large ADMS-COMMAND system to the South Korean National Fire Service Academy last year. ETC looks forward to working with HKFSD for years to come."

About ADMS, the Advanced Disaster Management Simulator

ADMS is a high fidelity interactive team training simulation platform that offers a proven methodology to provide cost-effective synthetic incident and disaster management experience. Since 1995, ADMS has been used to train emergency responders around the world to better prepare to respond to and mitigate incidents. By presenting engaging, real-world environments and stressful scenarios, ADMS enables response and rescue personnel to perform and enhance team and individual skill sets at all levels of response. It is also used to test and validate emergency response and management plans. ADMS bridges the gap between tabletop exercises and real world experience, and rapidly advances the effective coordinated response of multi-agency and multi-jurisdictional emergency responders during any type of disaster. Training with ADMS helps save lives and mitigate disaster's impact.

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Solberg Expands to Serve Asia Pacific Region

SOLBERG SCANDINAVIAN A/S, one of the largest independent foam manufacturers in Europe, has announced further growth through its expansion into the Asia Pacific Region. This follows the announcement of the purchase of the 3M patents associated with the RF foams and the 3M Fire-Brake BFFF Class A foam product (USFS listed).

Solberg Asia Pacific Pty Ltd will supply and support a complete range of Class B AFFF and AFFF/AR products based on telomer fluorochemistry. These products show high levels of fire performance against specifications like EN 1568, ICAO (Level B), LASTFIRE, and the UK MOD 42-40. These foam concentrates are known as the Solberg Arctic Foam™ products.

In addition to the AFFF product line, Solberg will promote the fluorosurfactant free RF technology products to customers who are concerned about future restrictions of use of the current AFFF technology. These fire fighting foams are branded as the Solberg Re-Healing Foam™ products, so named for their fluid flow characteristics, and are available as RF3 (3%), RF6 (6%), and RF 3x6 ATC™ (3%/6%) alcohol resistant foam concentrate. The RF foam technology has been manufactured in Europe by Solberg Scandinavian AS, under license from 3M, over the past five years, and now their continued supply is guaranteed with the purchase of the 3M intellectual property and patents. These products have been tested to the same specifications used to rate AFFF products such as EN 1568, ICAO



(Level B) and LASTFIRE showing strong performance as levels that matched the fire performance of fluorochemically based products.

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The origin of RF foam technology came from the 3M Australia product development laboratories, and lead to two global patents. The purchase of the 3M technology has presented an additional opportunity for Solberg Scandinavian AS (Norway), in the form of the product 3M Fire-Brake BFFF™ (FC-3150) Class A foam concentrate. Wildfire has now become a significant focus for Solberg Asia Pacific. This product has now been re-released as Solberg Fire-Brake™ 3150A Class A foam.

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Fire-ground video transmission:

finally a system that works

Thermal imaging camera (TIC) manufacturers have for about 5 years now been offering video transmission of images from camera to command vehicle. Today nearly every public procurement tender for TICs will include video transmission in the technical specification – but is it just a “box to tick” on the tender submission or does the end-user actually expect it to work?

Most manufacturers fit transmitters inside the camera to try to transmit video to a receiver mounted either in a command vehicle or to a briefcase receiver. Typically they can perform this function as long as the transmitter and receiver antennae have direct line-of-sight between them and are within about 200m range. But this does not provide much operational advantage to the Incident Commander – he wants to see live images from a thermal camera being operated inside the hazard zone, and this usually means inside a building or tunnel, and possibly below ground in the most dangerous of operations.

So, if a video transmission system is to be acceptable, what should the performance criteria be?

Singapore SCDF, long considered an early adopter of new technology in the region, has always maintained that their criteria for an acceptable video transmission system is to be able to receive clear, stable video from a body-worn transmitter three floors below ground to a command location within about 200m of the incident.

Domo Ltd., a UK manufacturer of digital COFDM video and telemetry systems for law enforcement and military users, has now released a Fire Service version of their hugely successful SOLO4 range of transmission systems, capable of meeting this requirement.

For years now Domo has been supplying this technology to law enforcement agencies who require high quality, completely mobile video and audio over long ranges – from 100m up to 10km using a body-worn system – and all of this is achieved in a non-line-of-sight environment i.e. the transmitter cannot “see” the receiver.

This is the toughest environment for any video transmission system but Domo’s implementation of the COFDM standard is highly resistant to interference and reflections, all of which destroy the analogue signal. The SOLO4 system uses a very narrow bandwidth (1.25MHz) to transmit the images. The narrower the bandwidth the greater is the transmission range and, significantly for the Fire Services, the better the penetration ability i.e. the ability to reach a receiver on the surface from a location underground.

Most of the other transmission systems will use a bandwidth of 25MHz, or at best 8MHz, both of which are too wide for effective transmission of signals from below ground to the surface.



Domo has successfully trialled this system in the Shenzhen MRT system in China, receiving high quality video from the platform levels below the surface – a transmission distance of >80m below the ground.

Avon Fire & Rescue in the UK have implemented a fire-ground perimeter wireless video system, using rapid deployment PTZ wireless cameras with Domo video transmitters to transmit images to the Incident Control vehicle from the four corners of the fire-ground. The four images are displayed simultaneously on a quad-split screen in the command vehicle and recorded on to a hard disk digital video recorder for investigation and analysis. The system can be deployed in minutes and provides a complete video record of the entire fire-ground incident.

Recently Avon Fire & Rescue decided to test the system in the Severn Tunnel, the UK’s longest underground rail tunnel at 7km length under the river Severn, connecting Wales with England.

The Domo SOLO4FIRE system successfully transmitted video from outside the tunnel entrance in Wales to a receiver located outside the entrance on the England side – a distance of 7km, non-line-of-sight, and through a tunnel with many curves and differences in elevation. In a typical Fire Service operation, the video transmitter will be located somewhere within the tunnel length, at the incident, and will be transmitting to a command vehicle located outside the tunnel. A copy of these trial results is available from Domo.

Each SOLO4FIRE transmitter transmits one video channel, two audio channels and one data channel.

There is no limit to the number of transmitters and receivers that can be deployed at an incident, allowing for perimeter fire-ground video coverage to run alongside thermal camera transmissions, all to the same bank of displays/recorders in the command vehicle.

The Bangkok Metropolitan Authority and the Thailand Civil Defence Force are the first services in Asia to deploy the latest SOLO4 transmission technology.

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For further information on this, the first truly effective fire-ground video transmission system, please contact James Moloney at: Domo Asia/Pacific Bangkok on +66-2-2318055/ +66-818555296 or by email at jamesmoloney@domo.co.uk

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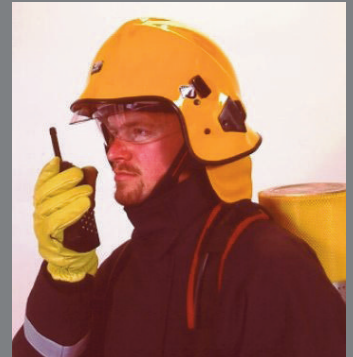
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Fire Fighting Helmet Standards are a-changing: But are they changing fast enough?

By Keith Ward

Pacific Helmets
(Australia) Pty Ltd.

2007 has seen significant changes to the various international Standards for structural fire helmets, and more are underway.

The latest 5-year update to NFPA 1971 was released earlier this year, and the result of the vote on the final revision of EN 443 is due before year-end. While the extent of changes to the NFPA Standard (as far as helmets is concerned) were minimal, the update to EN 443 is very significant and is complicated by virtue of the serious mismatch of EN 14458:2004 with the EN443 document.

The update of the Asian-Pacific region Standard AS/NZS4067 (Structural helmets only) is progressing thanks to the work of the SF.49 committee. While it is early days, the committee is clearly aware of the changes to other international Standards and will be looking to incorporate those that are appropriate for fire fighters in the region.

Despite this progress to update to the various Standards, some helmet manufacturers are already offering new designs that stretch the basic

concepts of new Standards. These commercial realities are likely to continue. Innovative manufacturers are well aware that for almost 90% of the time a helmet is worn, many front-line fire crews are wearing products that are too heavy, perhaps over-protective, impractical or inappropriate to the job at hand.

By far the majority of tasks facing structural fire fighters have little to do with structural building fires, yet the helmet they wear is designed assuming maximum risk and therefore has maximum weight and size. In the past this over-protection has been necessary because Fire Brigades have had to protect their crews and it has not been possible to separate various risk factors and wear helmets appropriate to the task.

This may be fine in the US market where bigger and heavier always seems to be better, but over weight and excessive size is an issue for Asia-Pacific



area fire fighters just as it is in Europe.

In trying to overcome the excesses of past helmet designs, one real challenge for helmet manufacturers is the fact that design restrictions written into helmet Standards can prevent radical new concepts reaching the heads of fire fighters. For instance, the NFPA 1971 document writers appear to get themselves in a knot about the 'jet-style' helmet shapes appearing in their market. Currently (though some manufacturers have tried), almost no jet-style structural helmets can be fully certified to this standard.

Similar problems affect helmet manufacturers attempting to update designs of helmets for Asia-Pacific region fire brigades. The current Standard sets lateral vision and other design restrictions that are not easily avoided by modern helmets with internally rotating face shields.

On the other hand, the new edition of EN 443 establishes two types on helmets (A & B) and these allow traditional style Type A helmets to cover less of the head than Type B helmets which must come down further around the head and provide much greater shell cover. These designs should mean much improved thermal and impact protection for fire fighters.

But the other huge change to EN 443:2007 is the addition of a flame engulfment test similar to test that can be applied under Annex E of EN 469:2005 to clothing certified to that standard. This is a major change that could well see a significant number of existing helmets off the market, or certainly requiring major sub-components upgrades. The test involves kitting a torso in full EN 469 jacket, SCBA mask, hood, and helmet complete with face shield, neck protector and Nomex chin strap. Because the flame and heat is directed both at the jacket as well as directly at the lower edges of the helmet for 10 seconds, the flame and heat rises from under, around and potentially inside the helmet. The Standard requires the temperature at the tip of the burners to be $950 \pm 50^\circ\text{C}$.

This is a very serious test. Without major changes, many existing EN 443 helmets will simply not pass this test, and it would be interesting if some impact tests or flame tests were subsequently conducted on these helmets. For those with polystyrene impact liners, injected plastic

shells or combustible internal materials will almost certainly fail.

An actual video of this test can be viewed on www.pacifichelmets.com/flameengulfment/

Most front-line fire crews will be grateful for the addition of this test to the Standard, as flashovers are comparatively common and pose a real threat to rescuers in many structural fire situations.

The other major complication for manufacturers has been the introduction of EN 14458:2004. This Standard established new tests for face shields and eye protectors on fire helmets, but appears to have had what can best be described as a very poor consultation process. While this document sets out to test face shields on fire helmets, it gets further into deep water by bringing in tests of a much wider range of design aspects of the helmet including ergonomics. These tests have little to do with face shields and in the view of the CEO of Pacific Helmets New Zealand David Bennett, the requirements of this document should have been considered for inclusion in the rewrite of EN 443.

Among a significant number of drafting errors, the writers of this Standard overlooked or forgot about the practical size and dimensions of face shields for real fire helmets. The result has been a requirement for face shields that are so large they virtually extend down to cover the wearers navel! This and other aspects of the document are currently under review by the CEN committee and will hopefully be resolved quickly.

The other major concern for Asian-Pacific fire fighters is the fact that the vast majority of tasks they face are nothing to do with structural fires but much more to do with RTA's, rural fire fighting, line or water rescues, paramedic operations and even rescuing cats out of trees. Heavy, bulky, inconvenient helmets simply get removed when conducting many of these tasks and fire crews are looking for vastly better designs.

Pacific Helmets New Zealand recently introduced a number of extremely innovative helmet designs and many of these are already certified to AS/NZS4067. For instance the F9 model is a traditional shape 3-layer helmet that begins with a simple and compact Level 1 helmet suitable for RTA/USAR operations, as well as rural fire fighting.



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This helmet is personal issue since every fire fighter must wear one, but the second layer over-shell (L2) is only truck issue and can be shared between shifts.

Reducing the number of structural helmet components significantly reduces the cost of the total helmet costs for fire brigades, but the concept needs to be understood by both brigades and unions to obtain acceptance. Once everyone

understands the significance of wearing a light 800gms convenient helmet for 90% of the time, the concept catches on.

The L1 helmet is also designed to be worn inside fire appliances while travelling at speed to call-outs and to provide full head protection in the event of an accident. Road accidents are actually the most common cause of death and injury to fire crews in Australia and New Zealand.

A third level of Kevlar reinforced over-shell is available for use in hot fire training schools and this protects the L1 and L2 helmet from smoke and unnecessary damage. Again, this third shell is shared between trainees at fire schools, is sacrificial but is designed to prevent unnecessary damage to operational helmets.

A similar model in a semi-jet style helmet is also available in the F10AS helmet. This stylish helmet can have an internal eye protector and an external face shield. It is actually a variation of a multi-level jet-style helmet and is already both AS/NZS4067 and EN 443 certified. Of greatest interest to individual users is the fact that this helmet can weigh as little as 1150gms including face shield and neck protector.

Pacific Helmets plan to announce a 2/3-level variation of the F10 jet-style helmet early in 2008 that not only has a Kevlar reinforced shell and full cranial impact liner, but with combined L1 & L2 weight as low as 1350gms. Again, the base L1 helmet weighing 800gms is designed for non-structural fire operations but with the addition of a strong outer Kevlar shell is still useable as a

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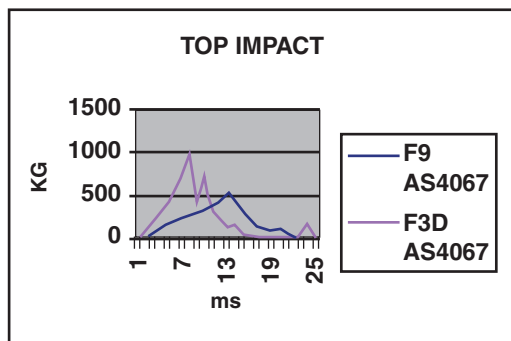
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structural fire helmet. By simply dropping on a the second shell (which is accomplished without even removing the L1 helmet from the head), the combination complies with AS/NZS4067, EN 443:2007 and EN 14458:2004. assuming face shield design issues are resolved in the latter document.

The very interesting technical aspect of multi-layer helmet designs is the fact that they provide superb impact and thermal protection. Top impact protection calculations show that multi-layer Kevlar shell helmets have 40% lower impact readings compared to single shell helmets.

Furthermore, while Kevlar shell/full impact liner helmets have virtually only 1.5–3°C temperature rises in EN 443 tests, the multi-layer helmets have zero temperature rises compared to the 25° increases permitted. But who wants to have a 25° temperature rise in their helmet anyway? With these sorts of test results the test is already irrelevant for high quality helmets.

These developments typify the difficulties facing Standards committees. Safety helmet development is proceeding so quickly that it is almost impossible for committees to keep up and manufacturers at the forefront of their game are driving designs forward very quickly. Traditional helmet designs like those typified by many old US and European designs may have held sway, but safety conscious brigades are looking for superior design options that offer their crews lighter-weight, more innovative helmet designs and most importantly, greater safety.

The issue for some Asian fire brigades is that historical helmet protection levels have been so low as a consequence of protection afforded domestic manufacturers who have manufactured extremely low specification helmets. This is not true of all brigades, for the Hong Kong, Singapore, Taiwanese and some Korean fire brigades have been equipping their crews (both fire and paramedic) with EN 443 compliant helmets for some years. This trend is becoming more common in both South Asia and the Indian sub-continent. The result will be a significant reduction in head trauma.

For many of these countries, the real issue in the first instance is one of raising the basic helmet and PPE performance standards. Whether they chose European CE or AS/NZS Standards, the benefits will be similar and front-line crews will be the beneficiaries. For other fire brigades in Australia and New Zealand, the traditional shape of helmet is likely to change to half or full jet-styles as the Standards document updates hopefully next year. With multi-function/multi-layer helmets now becoming available, stand-by for quite radical design shapes and features on fire fighters heads very soon. **APF**

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Pic courtesy of Dyne Technologies



Testing Fire Fighting Foam Used in Marine Applications

By Joan M. Leedy

President of Dyne Technologies

Most fire fighting foam users including marine applications fall under some governing body that requires – or at least recommends – the user test the foam on a regular basis to ensure foam quality.

One example of these codes is the National Fire Protection Association Standard on Foam (NFPA11) which recommends annual testing. The NFPA 11, 2005 edition, entitled “Low-Medium-, and High-Expansion Foam” reads as follows:

“At least annually, an inspection shall be made of the foam concentrates and their tanks or storage containers for evidence of excessive sludging or deterioration. Samples of concentrates shall be sent to the manufacturer or qualified laboratory for quality condition testing.”

Chapter 9 of NFPA 11 is exclusive to recommendations for Low-Expansion Foam Systems for Marine Applications. The testing and inspection

recommendation in the Marine chapter refers the user back to the NFPA statement above. Furthermore, NFPA 11 states:

“The inspection shall include performance evaluation of the foam concentrate or premix solution or both. Tests that deviate more than 10 percent from those recorded in acceptance testing shall be discussed immediately with the manufacturer.”

Other testing procedures covering marine testing include the International Maritime Organization MSC/Circ. 582 – the standard governing oil tankers and the United States Coast Guard, Department of Homeland Security 46CFR Shipping, subchapter D – Tank Vessels 31.10-18 Inspection and Certification, Firefighting equipment.

Table 1 – Periodic Testing Requirements for Marine Applications

	National Fire Protection Association Standard on Foam NFPA 11	United States Coast Guard 49 CFR	International Marine Organization
Frequency	Annually	Annually	Three Years after Installation and Annually Thereafter
Tests Required	Quality Condition Testing	"specific gravity, pH, percentage of water dilution, solid content and certification as a suitable firefighting foam"	Sedimentation – <0.25% pH Value – 6.0 – 9.5 Volumic mass, expansion, 25% drain time – within acceptable range of type approval.
Water	Not Specified	Not Specified	Sea Water

Similar to NFPA, the USCG requires periodic testing of foam be completed annually. The IMO specification requires foam be tested 3 years after installation and then annually thereafter.

Table 1 compares the periodic testing required by these three specifications. Of these three the IMO specification specifically states the tests required and the test result requirements. NFPA 11 and the USCG require the manufacturer or testing laboratory to set the testing and pass/fail criteria. In addition, the IMO specification requires the foam concentrate to be stored for 24 hours at a temperature of 60°C (140°F) prior to running the sedimentation, expansion and drain time test.

Typically testing laboratories will perform a series of tests including both physical properties tests on the concentrate as well as performance

tests on the foam solution. The following is a list of physical property tests that might be run on a foam concentrate sample.

The refractive index of a liquid is a measure of how much the speed of light is reduced as it travels through the liquid. The refractive index measurement can indicate whether the foam concentrate has been diluted or contaminated. The refractive index is typically measured on synthetic foam concentrates. It generally is ineffective on protein foam concentrates because of the high solids content.

The sedimentation test is run to ensure a minimal amount of sediment in the foam concentrate. The sediment level is determined by spinning the sample in a centrifuge for a specified amount of time. After spinning, the sediment collected at



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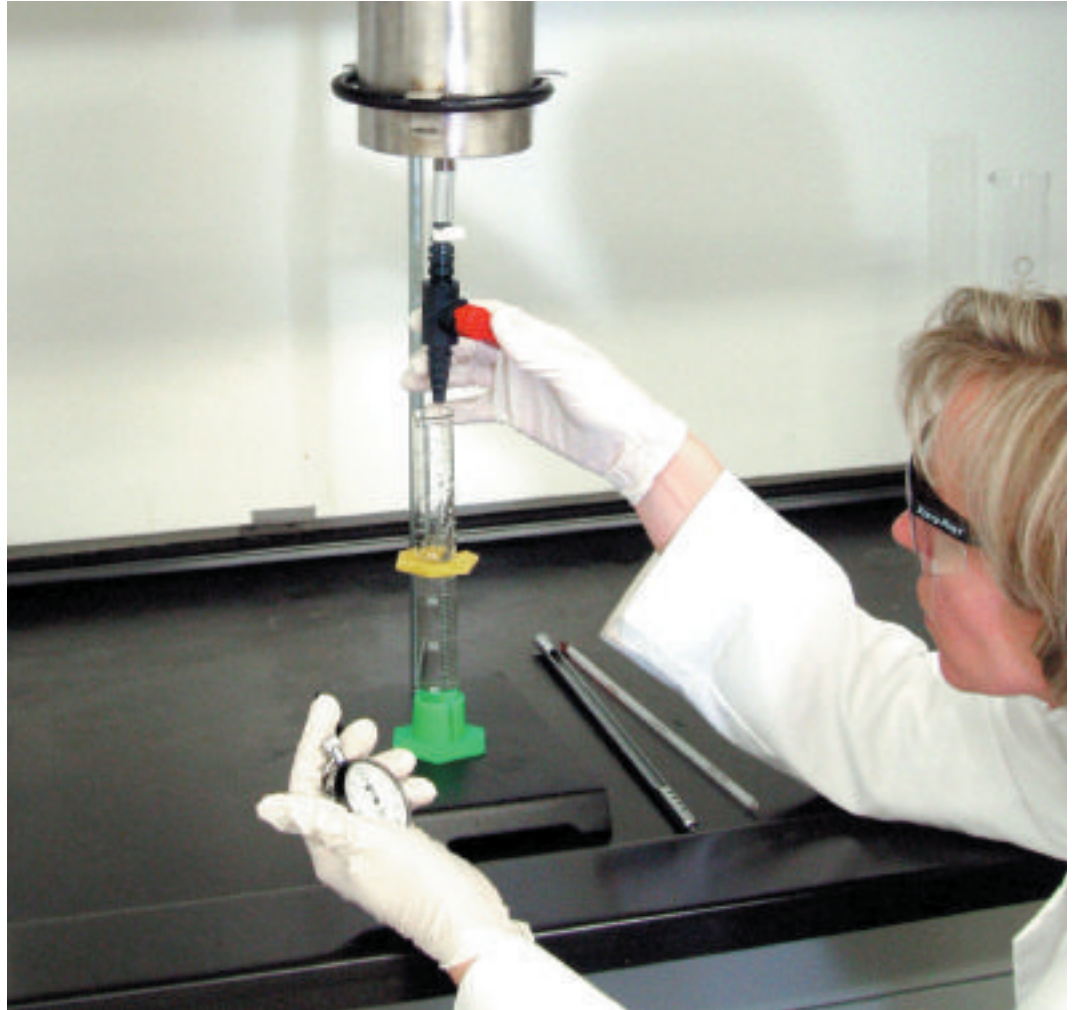
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the bottom of the centrifuge tube can be examined and measured. The percent sediment by volume can be calculated. Excessive sediment can be a sign of contamination and/or deterioration.

Viscosity is a measurement that quantifies a fluid's resistance to flow. A maximum viscosity level can ensure a foam concentrate will flow successfully through a foam proportioning system. An increase in viscosity can render the foam ineffective simply because it will not flow through the proportioning system and mix with the water.

pH is a measure of the acidity or alkalinity of a solution. The pH is measured for two reasons. A neutral pH of 6 to 9.5 ensures the product will not corrode the piping and tank in which it is stored. Furthermore, a neutral pH may be required to keep the foam ingredients mixed and in solution. A pH outside of this range can cause an ingredient to drop out of solution. For example, often times a foam with a low pH, below 6, will also show a low expansion because the chemicals in the foam that cause foaming are adversely affected by this low pH level.

The volumic mass can also be referred to as the specific gravity or density. The density is the weight of a given volume of a liquid. For a foam concentrate with a density higher than the system water, a decrease in the density can be a sign of inadvertent dilution of the concentrate with water. The concentrate density will vary depending on the type and nominal concentration of the product. A typical density for a protein-based 3% foam

concentrate is 1.158 grams per milliliter while a 3% aqueous film-forming foam concentrate would more likely be 1.030 grams per milliliter. Figure 1 is an example of how the density might change as a foam concentrate is diluted with the system water. Because sea water has a higher density (approximately 1.027 grams per milliliter) than fresh water (1.00 grams per milliliter), the system water must also be considered when analyzing the change in density of a concentrate over time. Note in the example in Figure 1 that density of the AFFF does not change significantly



Pic courtesy of Dyne Technologies



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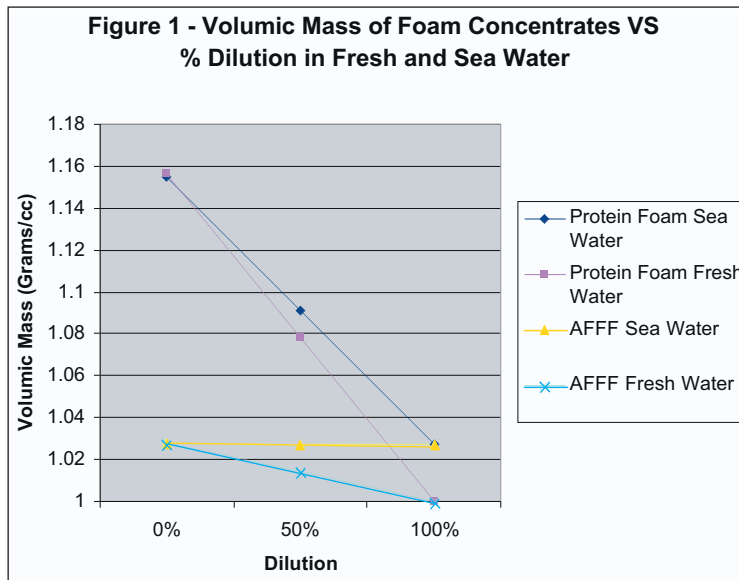
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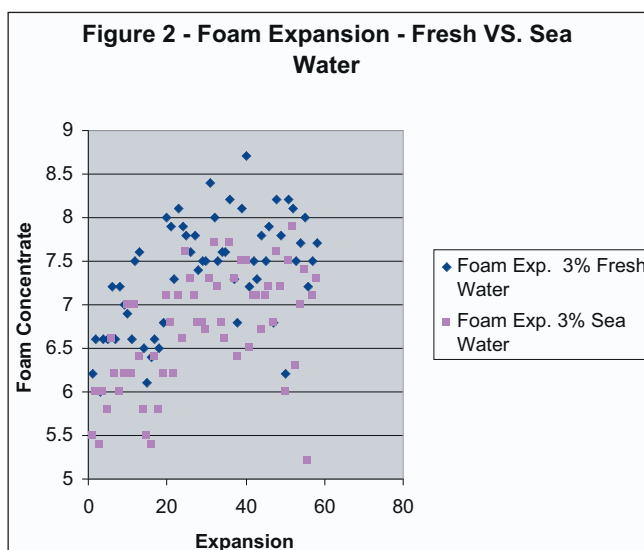
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as it is diluted with sea water because the density of the AFFF and the sea water are very similar.

While the tests discussed so far are all physical property tests completed on the foam concentrate, the remaining tests are all performance tests run on the foam solution after it is mixed with water. In order to run the performance tests, the foam concentrate must be diluted with water at the appropriate concentration. A 3% foam concentrate must be diluted 3 parts foam concentrate to 97 parts water, while a 6% foam concentrate is diluted 6 parts foam concentrate to 94 parts water. The IMO specification requires that the foam concentrate be mixed with sea water not fresh water.

Surface tension, interfacial tension and spreading coefficient are measured to determine whether or not a foam is a film-forming foam. A positive spreading coefficient ensures the foam is a film-forming foam such as is described by the name film-forming fluoroprotein or aqueous film-forming foam. Though not required to effectively extinguish a fire, the fire fighting capability of foam may be enhanced by its ability to form a thin water film on the surface of a non-water soluble flammable liquid.



The foam expansion is often used to characterize foam and to measure its performance. The expansion ratio is the weight ratio a given volume of foam solution to that same volume of expanded foam. For example, 1600 milliliters of fresh-water foam solution, prior to being expanded will weigh approximately 1600 grams. Once the foam is expanded this same volume of foam may weigh only 200 grams. The expansion in this example would be 1600 divided by 200 grams or 8:1. The expansion ratio does depend on many variables including water temperature, nozzle pressure and nozzle configuration. In

addition, the type of water used will affect expansion. Figure 3 shows the expansion ratio of 58 different foam concentrates measured both with fresh water and with sea water. Of these 58



Pic courtesy of Dyne Technologies

measurements, the sea water expansion was 0.66 expansion units or 8.9% less than the fresh water expansion.

The 25% drain time is a measurement of how much time it takes for 25% of the weight of a given amount of foam to drain back into a foam solution. This property is important because once foam drains into a solution it is no longer providing any fire extinguishing capabilities nor can it secure a spill from ignition. As with foam expansion, salt water can also reduce the 25% drain time of a foam solution. Figure 3 shows the drain time value of these same 58 foam concentrates when mixed with both fresh and sea water. On average, the drain time was 41 seconds or 9.2% faster when the foam concentrate was mixed with sea water than with fresh water.

Because typical marine applications use sea water and not fresh water for foam dilution and generation, it can be important in these

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- **Petro-chemical** - Oil terminal; Storage tank protection; Bund protection
- **Marine** - Tankers; Machinery spaces; Ferries; Offshore support and Fire fighting vessels
- **Aviation** - Hangars; Helidecks; Crash vehicles
- **Industry** - Sprinkler systems; Foam spray deluge systems; Medium/high expansion foam systems
- **Power Generating Plants** - Transformers; Cable tunnels; Conveyors; Coal bunkers



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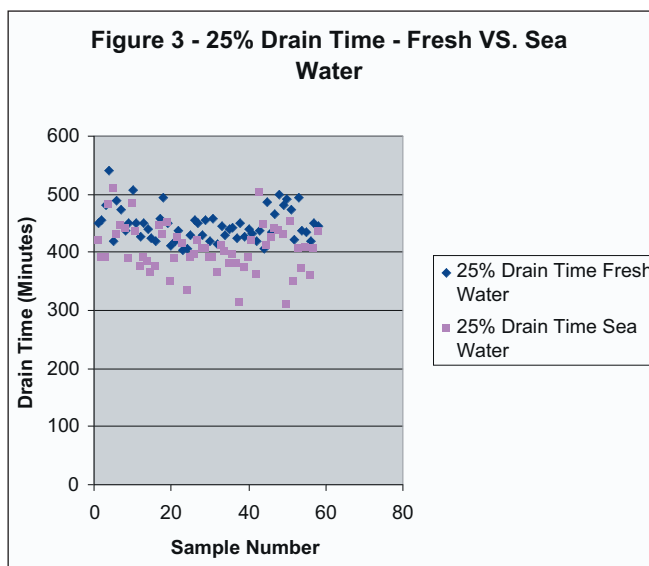
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applications to test the foam with sea water. Though the expansion and drain time of all foams may not be adversely affected by salt water, many are. By testing the concentrate with the water used in the application – fresh or sea – performance during a crisis situation is better assured.

In addition to periodic testing of foam stored on-board ship, specifications often require the foam be “Type Tested” prior to being used for a marine application. Type testing would require the foam manufacturer to have the brand and type of foam tested by an independent testing agency prior to use and is typically valid as long as the formulation or specification have not changed. All three marine standards – NFPA, USCG and IMO require that a foam concentrate initially complete and pass a testing protocol (type testing) prior to use on board ship.

Table 2 outlines the type test requirements for each of these specifications. The USCG and NFPA tests are the same. All three specifications require similar fire tests. The major difference in the IMO

specification is that it requires a positive spreading coefficient thus limiting use to film forming foams. It is also important to point out that the USCG does not simply approve foams but a foam system. Thus the foam quality of the small scale fire test nozzle must match the foam quality of the full scale equipment and an additional component of the specification would be ensuring the foam will proportioning correctly through the equipment. Also worth noting is the USCG specification requires a foam to initially be listed by Underwriters Laboratory through the specification UL 162. UL 162 is a complete specification in and of itself and includes requirements for foam quality, fire tests, and storage tests in addition to other test requirements.

This paper discusses only three specifications that apply to marine

applications – NFPA, USCG and IMO. Other specifications may apply depending on the jurisdiction. All of these specifications are designed to ensure the foam used on board ships will perform effectively. To ensure safety, consider the following:

- Fully assess the hazard on board and make sure the foam is designed to handle the hazard i.e., if polar solvents are on board, purchase a polar solvent foam.
- Purchase foam that will meet the applicable specifications and make sure the foam has been tested by an independent testing agency.
- Request a certificate of analysis from the manufacturer for the lot of foam purchased. If available the C of A will provide a baseline for many of the physical and performance properties.
- Test the foam when it is first installed to make sure the system will proportion it properly.
- Complete periodic testing of the foam system and the foam concentrate.
- Maintain records of all testing completed to monitor changes and trends.

APF

Table 2 – Type Testing Requirements for Marine Applications

	NFPA and USCG 49	IMO
Tests On Foam Concentrate	None	Freeze Thawing Heat Stability Sedimentation Kinematic Viscosity pH Volumic Mass
Tests On Foam Solution	Expansion 25% Drain Time Both Fresh and Sea Water	Spreading Coefficient >0 Expansion 25% Drain Time All Mixed with Sea Water
Fire Tests	9.29m ² (100 ft ²) Gasoline Two Sea Water Two Fresh Water	9.29m ² (100 ft ²) Gasoline Fire Sea Water
Additional Requirements	Listed by Underwriters Laboratory	None
Polar Solvents	For Use on Polar Solvents – Foam Concentrate must pass applicable UL 162 Fire Tests (50 ft ²)	Polar Solvent Use Not Mentioned

Joan M. Leedy is President of Dyne Technologies – ISO 9000:2001 compliance testing laboratory Member of the NFPA Committee on Foam Standards Technical Panel Member for Foam at Underwriters Laboratory



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Treating NFPA 99

Like a patient after a transplant or after receiving a vital transfusion, NFPA 99, Health Care Facilities, is on the road to improvement thanks to a Technical Correlating Committee (TCC) interested in making the proper diagnosis and a forward-thinking Standards Council.

By John Nicholson

Executive editor of
NFPA Journal

NFPA Journal®, September/October 2007

Inconsistent," "difficult to navigate," and "outdated" were terms used by users to previously describe NFPA 99. Hearing those words too often took a toll on the Technical Correlating Committee on Health Care Facilities, so they requested and received approval from the Standards Council for a comprehensive restructuring of the standard and the scopes and memberships of the Technical Committees (TCs) involved in NFPA's Health Care Project.

"The radical changes were necessary as NFPA 99 is a 25-year-old document that was a compilation of even older standards," says Technical Correlating Committee chair Douglas S. Erickson. "In reviewing the document there were chapters and annexes that had not been referenced for over a decade. With the dramatic changes in health care technology, electronic medical records, natural disasters, and a sicker patient population, NFPA 99 needs to be reinvented to fit this modern-day delivery system."

Erickson is also the director of research and development for the American Society for Healthcare Engineering and its representative to the Health Care Project. The society is part of the American Hospital Association.

The document is now in the Annual 2009 revision cycle and will result in a 2010 edition. In January 2007 the Standards Council gave its approval to the rosters of the project's Technical Committees. Those committees began meeting in February 2007 to begin writing the draft document, and the proposal closing is scheduled for this November. The TCs will have approximately 10 months to complete their work on the draft documents, which is very ambitious given the new subject areas as well as the need for reformatting the entire document.

"We are just starting to get proposals for the 2010 edition. This is going to be a very interesting ROP period as proposals will come in all shapes and sizes; some will want to only modify language in the 2005 edition; others will want to eliminate chapters or annexes; and I know of some which will be a complete rewrite of chapters/sections. It will be a real juggling act to follow NFPA procedures. The proposal closing date is November 29, 2007, and then all the fun will begin as the Technical Committees start to meet," says Erickson.

Road to recovery

The restructuring of the document, which is widely used throughout the United States, began in July 2006, when the Technical Correlating Committee on Health Care Facilities sought approval from the Standards Council. In its request, the TCC stated that the current standard is "difficult to navigate, is inconsistent in the chapter format, and needs to be updated to reflect current medical practices and procedures."

"We had three strategic planning meetings of the TCC and invited the chairs of the TCs to attend and participate in the planning process," says Erickson. "We also met frequently with NFPA's Codes and Standards Administration staff to make sure they were aware of the direction we were headed and could offer advice and counsel if there appeared to be potential conflicts with other standards. Our staff liaison also played a critical role in making sure we were not violating any organizational rules or protocols."

In making its request, the TCC did not propose any change to their TCC scope but provided the Council with proposed revised scopes for all but one of the TCs within the project. The proposed plan presented to the Standards Council in July

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2006 had eight TCs re-aligned into seven TCs with all responsible for portions of NFPA 99.

According to the initial presentation to the Standards Council, some of the existing TCs were to be merged with others, some were to be eliminated, and new TCs were proposed. The following are the proposed details the TCC first presented to the Standards Council in July 2006:

- **TC on Fundamentals:** This committee is being renamed "Fundamentals" from "Administration." In addition to its existing responsibilities, this committee will also be responsible for determining the relative risk level of various medical procedures in order to specify the level of service. This would pertain to gas and vacuum systems, electrical systems, fire protection, and special hazards. For example, they will determine the relative fire risk in an operating room or MRI and specify a particular fire extinguisher or suppression/detection system to protect the hazard. It is not anticipated that this committee will develop any fire protection or egress requirements that are already covered in other standards or codes, such as NFPA 101®, *Life Safety Code*®, NFPA 13, *Installation of Sprinkler Systems*, or NFPA 72®, *National Fire Alarm Code*®. It may extract or reference these requirements into NFPA 99 where appropriate.
- **TC on Medical Equipment:** This new committee would be a merger of the existing TC on Electrical Equipment and the TC on Gas Delivery Equipment. There is no proposed change from the existing scope or intent of the two existing committees.
- **TC on Electrical Systems:** This is an existing committee, but its scope will be expanded to go beyond just electrical power systems. In addition to electrical power systems, the committee will

In its request, the TCC stated that the current standard is "difficult to navigate, is inconsistent in the chapter format, and needs to be updated to reflect current medical practices and procedures."

also address low voltage systems such as nurse call systems, telemedicine, wireless technology used in patient care, and informatics (electronic information data bases). This committee may extract or reference the requirements from NFPA 70, *National Electrical Code*®, into NFPA 99 where appropriate.

- **TC on Mechanical Systems:** This is a new committee that would address the existing performance operations, testing, and maintenance requirements for failure management criteria for air quality, and also address new subjects such as temperature, humidity control, critical space pressure relationships for infection

control water and wastewater, and air quality issues. This committee may extract or reference the requirements from NFPA 90A, *Installation of Air-Conditioning and Ventilating Systems* into NFPA 99 where appropriate.

- **TC on Emergency Management and Security Committee:** This is an existing committee with an expanded scope to include security issues in health care facilities. This committee will continue to address the requirements pertaining to emergency management as currently addressed in NFPA 99. They will also co-ordinate with NFPA 1600, *Disaster/Emergency Management*

There are several major milestones that must be completed in short order that include disbanding the existing committees, forming new committees, and drafting the reformatted document NFPA 99.

and *Business Continuity Programs* where applicable. This committee will address a new subject of health care security. Currently the TC on Premises Security addresses security in health care facilities in NFPA 730, *Guide for Premises Security*. The TC on Emergency Management and Security is requesting they have the primary responsibility for security in health care facilities. This material may be extracted or referenced by NFPA 730. The TC on Emergency Management and Security would address issues such as infant abduction and drug diversion.

- **TC on Piped Gas Installation:** This is an existing committee with a name change. This committee will address installation, performance, maintenance, and testing requirements for piped medical and dental gas and vacuum systems.
- No changes were proposed for the **TC on Health Care Facilities** and the **TC on Hyperbaric and Hypobaric Facilities**.

Criticality of timing

According to the TCC leadership, time was vital for the project's success, and it pushed for a timely transition. NFPA 99 is currently in the Annual 2009 cycle with the proposal closing date for this cycle in November 2007. There are several major milestones that must be completed in short order that include disbanding the existing committees, forming new committees, and drafting the reformatted document NFPA 99. Therefore, the proposed timeline for the project is as follows:

- July 2006, Standards Council reviews a proposed restructuring.
- November 2006, Council approves the restructuring. Disbands all existing TCs and places a call for committee members for all TCs.
- January 2007, the Standards Council appoints the chairs and start up roster.

- January 11, 2007, TCC meets with all TC chairs to review the scope of the project and to make assignments to develop the new documents.
- February 2007, TCs start to meet and develop new draft documents.
- November 2007, TCs complete the draft documents.
- January 2008, ROP meetings.
- September 2008, ROC meetings.
- June 2009, Association meeting.
- July 2009, Standards Council issues documents.

The TCs will have approximately 10 months to complete their work on the draft documents, which is very ambitious given the new subject areas as well as the need for reformatting the entire document.

"In teaching the principal elements of the standard for over 20 years, it was becoming evident to the users of the document that it needed to be



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modernized. The membership of the American Society for Healthcare Engineering and the TCC all agreed that a 'band-aid' approach was no longer sufficient to get the standard ready for 2010," Erickson says.

Standards Council response

At its July 2006 meeting, the Standards Council considered the request from the Technical Correlating Committee on Health Care Facilities for the proposed restructuring of the Health Care Facilities Project.

After a review of the proposed new structure, the Council requested that the TCC further clarify where in the proposed new structure the project was intending to assume primary jurisdiction for subject matter that was currently within the jurisdiction of another project.

Specifically, the Council requested that the TCC identify where, through the proposed new structure, the Health Care Facilities Project was requesting primary jurisdiction over any subject

Homeland security

One aspect of the proposed restructuring relates to the on-going attempts to address homeland security-related concerns within the NFPA codes and standards process. In this case, the Health Care Project TCC proposed expanding the name and scope of the TC on "Health Care Emergency Management" to the TC on "Emergency Management and Security" to include security issues in health care facilities.

In accordance with the Council's policy on homeland security issues, the Council solicited specific comment on the proposed expansion of the Health Care project to address security issues in health care facilities.

As requested, the TCC solicited additional information, and in November 2006, the Standards Council voted to approve the restructuring, with modification, the approved TCs and respective TC scopes as previously discussed.

All existing members of the Health Care Facilities Project Technical Committees reapplied, and a

Specifically, the Council requested that the TCC identify where, through the proposed new structure, the Health Care Facilities Project was requesting primary jurisdiction over any subject matter that it would currently have been required to address by reference to or extract from other documents in accordance with extract policy.

matter that it would currently have been required to address by reference to or extract from other documents in accordance with extract policy.

The Council was concerned that the Health Care Facilities Project might, through the proposed new scopes and structure, be proposing to take primary responsibility for establishing requirements on certain subjects that were currently the responsibility of other Projects. If this was the case, the affected projects were informed and had an opportunity to provide input to the Council before the Council took further action on the proposed new structure.

Once that additional information was provided, the Council directed that the proposed restructuring be circulated through the normal channels for public review, with specific notice directed toward other related and affected Projects in the NFPA codes and standards process. In addition to soliciting comments from the existing TC in the Health Care Project, the Council directed that comments be solicited from the committees responsible for the following NFPA documents: NFPA 1, 13, 14, 45, 52, 90A, 70E, 72, 101, 110, 318, 730, 1600, and 5000.

notice was published calling for new members and specifically soliciting additional expertise as necessitated by this restructuring.

Change of scope, change of name

The Standards Council revised the scope of the Technical Committee on Electrical Systems (HEA-ELS). It shall have primary responsibility for documents or portions of documents covering the minimum requirements for performance, testing, maintenance, operations, and failure management of electrical systems, low voltage systems, wireless technologies, informatics, and telemedicine to safeguard patients, staff, and visitors within health care facilities.

The Technical Committee on Fundamentals (HEA-FUN) underwent a TC name change from Administration to Fundamentals and its scope was revised. This Committee shall have primary responsibility for documents or portions of documents on the scope, application, and intended use of documents under the Health Care Facilities Project, including reference standards, performance, the protection of special hazards, criteria for levels of health care services based on risk, as well as

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definitions not assigned to other committees in the Health Care Facilities Project.

The Technical Committee on Health Care Emergency Management and Security (HEA-HES) is a renamed committee as well and its scope was revised. Its name was changed from Health Care Emergency Management to Health Care Emergency Management and Security. This Committee shall have primary responsibility for documents or portions of documents covering the framework for emergency management and security of health care facilities proportionate to the risk of the patient and health care staff. This Committee shall have primary responsibility for the elements of planning over a continuum from minor incidences to catastrophic events, including: management controls, mitigation practices, incident response, continuity of services, recovery, stored capacity, staff training, and program evaluation.

The Standards Council also formed a new Technical Committee on Mechanical Systems (HEA-MEC) that shall have primary responsibility for documents or portions of documents covering the performance,

Committee on Piping Systems (HEA-PIP) maintains primary responsibility for documents or portions of documents covering the performance, maintenance, installation, and testing of medical and dental related gas piping systems and medical and dental related vacuum piping systems.

In addition, the Health Care Facilities Technical Correlating Committee (HEA-AAC) remains responsible for documents that contain criteria for safeguarding patients and health care personnel in the delivery of health care services within health care facilities: a) from fire, explosion, electrical, and related hazards resulting either from the use of anesthetic agents, medical gas equipment, electrical apparatus, and high frequency electricity, or from internal or external incidents that disrupt normal patient care; b) from fire and explosion hazards associated with laboratory practices; c) in connection with the use of hyperbaric and hypobaric facilities for medical purposes; d) through performance, maintenance, and testing criteria for electrical systems, both normal and essential; and e) through performance, maintenance, testing,

The Technical Committee on Hyperbaric and Hypobaric Facilities (HEA-HYP) retains primary responsibility for documents or portions of documents covering the construction, installation, testing, performance, and maintenance of hyperbaric and hypobaric facilities for safeguarding staff and occupants of chambers.

operations, testing, maintenance, and failure management criteria for air quality, temperature, humidity, critical space pressure relationships, water and wastewater, and their associated systems.

The TCs on Electrical Equipment and Gas Delivery Equipment merged to become the Technical Committee on Medical Equipment (HEA-MED), which shall have primary responsibility for documents or portions of documents covering the maintenance, performance, and testing of electrical medical equipment and portable patient-related gas equipment for the purpose of safeguarding patients and health care personnel within patient care areas of health care facilities from the hazards of fire, explosion, electricity, non-ionizing radiation, heat, and electrical interference.

Unchanged TCs

The Technical Committee on Hyperbaric and Hypobaric Facilities (HEA-HYP) retains primary responsibility for documents or portions of documents covering the construction, installation, testing, performance, and maintenance of hyperbaric and hypobaric facilities for safeguarding staff and occupants of chambers. The Technical

and installation criteria: (1) for vacuum systems for medical or surgical purposes, and (2) for medical gas systems.

At its meeting in January 2007, the Standards Council approved the rosters for the Technical Committees for electrical systems, fundamentals, health care emergency management and security, hyperbaric and hypobaric systems, mechanical systems, medical equipment, and piping systems.

Has the restructuring met with the TCC's expectations? According to Erickson, yes and no.

"For the most part the TCC members are satisfied with the restructuring and the new Technical Committee structure. There are some, however, who don't believe we are going far enough with revising the 2010 version," says Erickson. "In the initial meeting the TCC had discussed looking at defining various levels of health care and writing standards to fit the levels. For example, a limited critical care unit in a rural hospital has different minimal needs than a critical care unit in a major urban tertiary medical center. What we all need to remember is this is a work in progress and if it all doesn't get done for the 2010 edition it can still happen for 2013."

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John Nicholson is the executive editor of NFPA Journal. He can be reached at jnicholson@nfpa.org

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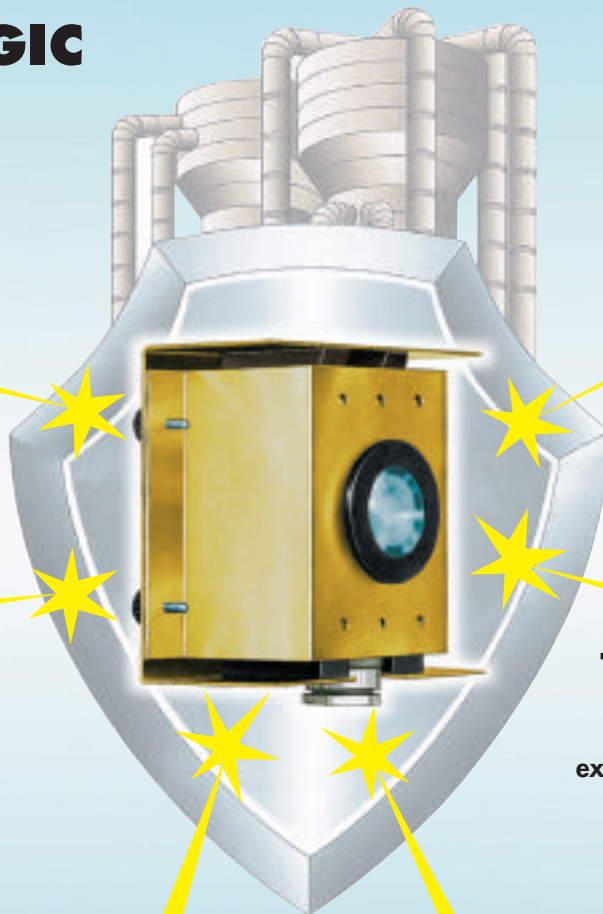


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Not All Hazards are the same:

Design considerations for matching flame and gas hazards to detector technologies

Not all flame and gas hazards in facilities are the same, therefore the detection technology chosen should be specific to the type of hazard to be detected. How do users select technologies to see certain fires or detect certain gases? The intent of this paper is to give a broad introduction to the selection and use of flame and gas detector technologies.

We will answer questions such as these: When should a flame-detector solution use infrared vs. ultraviolet detectors? Which gas-detector technologies are appropriate for flammable gases, hydrocarbon gases, and toxic gases?

By Simon Pate

Director of Projects and
Systems, Detector
Electronics Corporation

One size does not fit all

A safety engineer at an LNG facility reviews two flame detectors: an uncertified infrared (IR) detector and an FM-approved triple IR detector. Which should she choose? Meanwhile, a plant manager, considering gas detectors for his off-shore facility, researches which type of detector – electrochemical or semi conductor – is proven to sense hydrogen sulfide accurately. What criteria should he use?

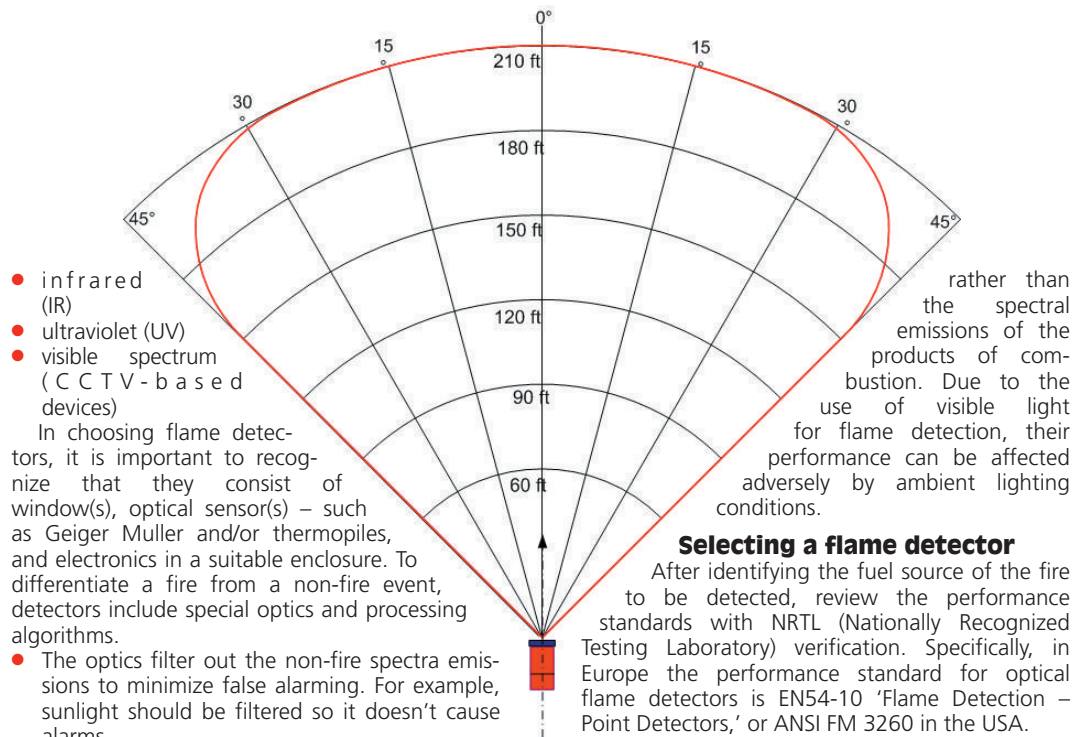
Today's flame and gas detection technology should be applied specifically to the hazard or hazards to be detected. One type of detector technology might be more suitable than another in a specific situation.

Flame-detection principles

In general, a hydrocarbon fire emits CO₂, carbon, water, and heat (IR). Certain flame detectors see these types of combustion products. But those same flame detectors, for example, might not see SO₂ that is produced by a sulfur-fueled fire – therefore, that sulfur-fueled fire might go unseen.

Because not all fires are the same, a flame detector must be matched to the type of fire fuel that it is expected to see. Various technologies and algorithms enable detectors to be sensitive to certain fuel fires. These technologies primarily use the following emissions spectra for optical flame detection:

Cone of vision illustration shows the field of view with off-axis limits of 45°



In choosing flame detectors, it is important to recognize that they consist of window(s), optical sensor(s) – such as Geiger Muller and/or thermopiles, and electronics in a suitable enclosure. To differentiate a fire from a non-fire event, detectors include special optics and processing algorithms.

- The optics filter out the non-fire spectra emissions to minimize false alarming. For example, sunlight should be filtered so it doesn't cause alarms.

- Sophisticated algorithms analyze the optical signals and determine whether the detector is seeing a fire or non-fire event. These algorithms are, in most cases, patented and closely guarded.

This is why different manufacturer's detectors have different performance, although they might use the same technology.

Flame detection technologies

The technologies widely used today are based on UV and IR sensors, and combinations of UV and IR sensors. CCTV is an emerging technology being used in some flame or smoke detection applications.

UV-based detectors – The first flame detection technology used, UV detectors provide good response to a broad spectrum of hazards. Lightning, the sun, and arc welding can cause false alarms. Also, radioactive sources can generate false alarms because UV detectors are based on a Geiger-Mueller tube. The performance of UV detectors might be impaired by certain chemicals that attenuate UV light, such as oils, silicones, ethanol, and ammonia. Consult your detector manufacturer for a comprehensive list of UV-attenuating chemicals.

IR-based detectors – IR emissions are generated by any material that is above absolute zero, such as the sun, a person, or any black body. IR detectors can be prone to false alarms from chopped or modulated IR sources. Carbon-based fueled fires are strong emitters in the IR spectrum, therefore single-IR and dual-IR detectors are suitable for their detection.

Multiple IR (MIR) – The MIR (or triple IR) sensor flame detector (Figure 1) is a newer technology that is displacing the other technologies in many applications, due to better performance and fewer false alarms. These detectors have the greatest on-axis detection ranges (>200ft) of any technology.

UV/IR – Because the combination UV/IR detector reduces false-alarm issues, it has been popular. But it is being displaced by the new generation multi-IR detectors.

CCTV – An emerging technology, there are a few CCTV flame detectors available for specific fuels. CCTV devices use visible light for flame detection,

Selecting a flame detector

After identifying the fuel source of the fire to be detected, review the performance standards with NRTL (Nationally Recognized Testing Laboratory) verification. Specifically, in Europe the performance standard for optical flame detectors is EN54-10 'Flame Detection – Point Detectors,' or ANSI FM 3260 in the USA.

The standard test fuel in most standards is n-Heptane. But because that might not be the fuel in your hazard, confirm that the selected detector will see the hazard in a specific application. The detector manufacturer should provide documented, third-party verification for cones of vision, size, and response times to various fuels.

Maintenance: Because flame detectors are optical devices, they depend on the cleanliness of their lenses, which can be obscured by insects, ice, oil mists, and other environmental contaminants. Many detectors have optical integrity tests that verify the lens cleanliness and signal failure. Some contaminants can be handled by detector innovations, such as heaters to displace rain and ice. In addition, some manufacturers provide built-in calibrated test lamps so you are assured they are operating correctly.

Field of View: Many manufacturers claim various cones of vision from 120° to 90° and maximum on axis distances now beyond 200ft. The US and European standards both define the off-axis limit to be where 50% of the on-axis detection capability is lost. See figure 2 for an example cone of vision.

Gas-detection principles

Gas detection may measure several characteristics of gases, for example toxicity or flammability. To detect a particular gas successfully requires determining a unique attribute for the target gas that can be sensed and measured.

- Flammable gases are measured as a percentage of their Lower Explosive/Flammable Limit (LEL/LFL). For example, Methane LEL is 5% in air. Toxic gas detectors in general are measured in parts per million (ppm).
- Hydrocarbon gases can be detected either by their combustibility or IR absorption properties.
- Toxic gases are more difficult to detect due to their various chemistries and unique characteristics. The primary toxic sensor technologies used are solid state and electro-chemical, although there are emerging technologies that use optical sensors.

Gas detection technology

Catalytic/Combustible Gas Sensors (CGS)

This is an old and trusted detection method that uses two platinum sensors, one of which is exposed

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Eclipse IR gas detector



Selecting a gas detector

After identifying the gas to be detected, review performance standards and certifications, look at maintenance issues, and determine interface requirements (covered in the next section).

Optical-based gas detectors generally require a bump test (using a target gas on the detector to produce a reading). Catalytic/toxics and semi-conductors require frequent calibrations and gain adjustments due to sensor depletion. The calibration frequency is driven by the level of background gas and/or environmental conditions that may affect sensor life.

to the environment. The active sensor makes a destructive measurement of a flammable gas. This measurement is created by the burning of the target gas on the exposed sensor. This burning causes a change in resistance, which is compared to the sealed/reference sensor this then indicates the level of flammable gas present.

The drawback is that this burning also destroys the sensor. In time, the sensor burns out. Hence CGS devices require frequent testing and calibration to adjust the gain as the sensor is depleted. The failure modes of a CGS device are not self revealing. In the presence in 100% LEL gas the sensor will go full range and then zero as the sensor burns out. CGS is used to detect hydrocarbons and hydrogen gases.

Point IR Detectors (PIR)

This newer technology depends on the hydrocarbon bonds within the flammable gas absorbing IR energy. This absorption is then temperature compensated and adjusted for the target gas to give a %LEL reading. These detectors have failure modes (loss of emitter) that are easier to detect than those for the CGS detectors.

Open Path Gas Detection (OPGD)

This technology uses the same principal as the PIR, but the distance between the transmitter (IR source) and receiver can be over 100m apart. Most of these detectors are ranged 0-5LELm. The total amount of gas in the path is measured. The detector cannot discriminate between a large cloud of low concentration gas and a small cloud of high concentration gas.

Ultra-Sonic

This emerging technology uses microphones to detect high-pressure gas leaks by their acoustic signature. Ultrasonic detection is not dependent upon the gas cloud being transported to a sensor. The measurement is leak or no leak.

Electro-chemical (EC)

This technology is used primarily for toxic gas detection. Each gas has a specific EC cell chemistry. However many EC cells are cross sensitive and may respond to other gases. These sensors have several wear-out mechanisms – drying due to desiccation by the ambient conditions, and electrolyte depletion.

Semi Conductor

This technology is primarily used for toxic gas detection and especially H₂S. It has the advantage that it can be used in arid conditions where EC cells would quickly dry out.

Detector interfaces

There are three primary methods by which detectors can be connected to a control or fire-alarm system:

- 1 Contact signal is the generic interface as recognized by the National Fire Alarm Code (USA) for flame detectors. Gas detectors may have contacts that can be set at specific alarm levels.
- 2 4-20mA signal may be used if the fire alarm system and the flame detector are listed together for code compliance. It should be noted that the 4-20mA is not like a process variable. It is a stepped output that indicates the status of the detector, such as faults and processing status. For gas this is the best interface as the value can be trended so gas levels across a facility can be reviewed.
- 3 Addressable – this is similar to fieldbus – however these are generally proprietary interfaces, due to code compliance. Addressable systems offer the greatest amount of information about the health and status of a detector.

Other considerations for 'detectability'

Unlike process devices that have direct contact with the process and the property to be measured/sensed, flame and gas detectors are non-contacting. This indirect sensing creates issues that must be addressed for successful detection.

Flame detectors are optical devices and need an unobstructed view to the hazard. Positioning of flame detectors requires several performance definitions: hazard type, distance to hazard, size of hazard, and required response time. From these parameters, a technology can be selected and positioning performed, to ensure the required level of protection is attained, and false-alarm sources are kept out of the field of view. Flame detectors cannot tell if they have been obstructed, for example if scaffolding is obstructing their field of view. Hence it is important to visually verify the aiming and field of view of flame detectors.

Similarly for gas detection – the performance definitions are gas type and response time. Positioning of gas detectors depends on air-flow patterns and specific gravity of the target gas. For example, if the gas is lighter than air, the gas will rise; if heavier than air the gas sinks to ground. Gas detector placement is more art than science in many situations. Gas detectors (non acoustic) require that the target gas reach the detector i.e. are dependent upon a transport mechanism

There are many optical and transport mechanisms that need careful consideration when locating flame and or gas detectors, and may require modeling to help determine the optimal location of the detectors.

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TASK FORCE TIPS
FIRE FIGHTING EQUIPMENT

Some firefighting situations demand the controlled strength of a master stream device like TFT's portable/deck gun monitor, the Crossfire. In the moments that solid, constant water supply is essential, devices such as this can deliver 4,500 l/min (1250 gpm). Higher flow rates can mean increased reach, better penetration, and best overall use of limited staff power



Large Fires Require Large Water and Foam Flows

Fixed and Portable Monitors Offer Increased Fire Flow Capabilities Safely

Many times the large volume of fire encountered by arriving crews quickly precludes the use of standard hand-held nozzles for initial attack. In these cases, the movement and accurate delivery of water or foam, as well as establishing a constant sustainable water supply, becomes critical to successful extinguishment and exposure protection operations. High flowing portable, fixed and remote controlled monitors provide the performance necessary to meet these high flow challenges, even when staffing is limited.

By Rod Carringer

Task Force Tips, Inc.

Fires requiring large volumes of water or foam solution for suppression (high critical application rate) dictate the water supply and fire streams management operations from the moment the first apparatus arrives. If the fire has burnt past workers, or is generating more BTUs on the fire/time curve than the crew can deal with, adding more hand-held lines may provide little or no suppression success. Though the use of pre-plumbed monitor on apparatus and lightweight

portable monitors may be rare in many jurisdictions due to the inability to supply an adequate sustained fire flow, their tactical versatility cannot be overlooked.

Often considered strictly a defensive tool for those large exterior attacks, pre-plumbed master stream devices and smaller portable monitors can be an effective initial attack option when staffing on the apparatus is limited and the volume of fire upon arrival is substantial. Even with the limits of

Portable monitors, such as TFT's patent pending Blitzfire, are specially designed to go anywhere a handline goes, yet boast flows of up to 2000 l/min (500 gpm). Protective features, such as the Blitzfire Safety Shut Off Valve, are the small considerations that can pay off in a big way when a crew's attention is focused on the flames



working from the apparatus water tank, placing a heavy stream from a fixed or portable monitor for 60 seconds directly into the fire's volume can sufficiently darken it down, so hand-held nozzles can be deployed for final suppression. All of this can be accomplished successfully using only the water on the first arriving apparatus. This sort of "Blitz" Attack is an ideal tool for agencies that struggle with limited staffing, yet must manage ever-increasing fires.

Keeping in mind the additional water supply requirements, the use of portable monitors and apparatus mounted master stream devices can provide some of the following benefits:

- Higher initial attack fire flows and increased stream reach can offer improved fire fighter protection by allowing crews to work in more tenable atmospheres while providing higher fire knockdown potential
- In limited staffing situations, higher fire flows can safely be provided with minimal personnel. Evaluating fire flow performance, typically more gallons per minute per person can be delivered than with any combination of hand-held nozzles.
- A single line put in service with a portable monitor can deliver from 2000 l/min (500gpm) up to 4500 l/min (1250gpm), providing a wider range of options to meet changing fire ground conditions. The new lightweight features of the portable monitors offer quick deployment and the ability to better utilize pump capacity and available water supply during initial attacks. Faster fire extinguishment translates to an overall reduction in the stress level of initial attack personnel.
- A single larger "Blitz" line can be as effective as up to 5 hand-held nozzles with hose and support. This can amount to a large savings in time and human resources.
- Higher flow rates from fixed, remote and portable monitors provide increased reach and penetration over hand-held nozzles.

- The high flow devices can support a more effective allocation of personnel resources on the fire scene and allow the first arriving apparatus more tactical versatility.
- Portable monitors can provide unparalleled safety in hazardous material and vapor mitigation procedures, exposure protection, and high flow foam applications with self-educing master stream nozzles.
- The "scale up" feature of starting with a single supply line into a portable monitor followed by a second line, allows the device to be used for a quick initial attack, or upgraded to a larger defensive operation as required by the fire ground commander.

Once you have integrated the use of the master stream into your initial attack operations, the only way to feel comfortable operating these high flowing devices, especially when the water tank on the apparatus is your primary supply, is to practice and understand the capabilities of the equipment and how to properly deliver capacity to the seat of the fire.

Even with the previously noted benefits of using high flow portable or truck mounted appliances, successful suppression strategies often fail due to some of the following reasons:

- Lack of training will always affect the procedures used in proper deployment, placement, advancement, and operation of attack lines.
- Though smaller supply lines are flexible and mobile, their flow capacity is limited. The use of large diameter hose will provide higher flows, but will restrict advancement of the line after flow has been initiated.



Master Stream operations can now take place remotely, allowing limited staff to maximize their performance safely. These remote controlled monitors allow firefighters to control the stream from the pump panel or anywhere on the fire scene using radio frequency controls

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Small monitors, like Task Force Tip's new Blitz Lite, can deliver up to 2000 l/min (500 gpm). Faster knockdown easily translates into reduced stress on attack personnel. When storage space, big water, and easy deployment are concerns, the new line of compact, hard-hitting monitors like TFT's Blitzlite are the answer

Rod Carringer is the Vice President of Sales and Marketing for Task Force Tips. For the past twenty-one years Rod has had direct oversight of all aspects of distribution including field education of fire service professionals, management of distribution partners, over a dozen TFT field representatives, and an active marketing team. As a 32-year volunteer member of Coolspring and Center Township Fire Departments in LaPorte, Indiana, Rod performs research and development, training and active firefighting duties daily. As past Chief of Operations his experience in suppression activities allows him to serve as a State of Indiana Instructor, and as co-founder of the Duneland Fire School Committee in Northwest Indiana. As a past member of the Fire and Emergency manufacturing and Services Association Board of Directors, he remains active in national association activities and legislative initiatives that support the US Fire Service. Rod's background and continued activities as a structural firefighter allow him to gain tremendous input from fire agencies around the world. This information is utilized in TFT's New Product Development Team, the Strategic Planning Group, and the Marketing Group's direction as TFT seeks new techniques and products to make the stressful job of fire suppression faster and safer.



- As the smaller attack lines are typically the first ones deployed on most fires, common belief is that the application of high flows and the use of associated equipment are either unnecessary or unwise. Many times this assumption is correct. Yet, for the small percentage of fires that cause the largest dollar losses, low flowing hand-held nozzles are often proven ineffective as the move is inevitably made to defensive operations.
- Improper or inadequate training on this type of initial attack can result in extreme water usage and potential weakening of the fire structure.
- The choice of supply line to a portable monitor will, in some manner, affect its use. Smaller line, limited water delivery but maximum maneuverability, larger line, unlimited flow capabilities, but it stays where it is laid.
- And finally, there remains the perception that these devices are strictly for defensive firefighting operations.

The next issue when using a pre-plumbed master stream device is Safety. Climbing nearly ten feet up the side of an apparatus, walking across a slippery hose bed, and standing in a storage area with loose equipment is not a great idea even under the best conditions. Add cold or freezing temperatures, darkness, and the level of adrenaline the first arriving crew has, and you have a recipe for someone falling from the apparatus and sustaining a career ending injury.

So the next question is: "How do you follow the recommendations of apparatus manufacturers and keep the firefighter's feet on the ground?" This can be simply accomplished by considering remote control operations of the apparatus' fixed monitor. Remote control monitors can quickly provide a heavy attack stream with only the touch of a button. With either radio frequency remote controls, or a panel mounted control station, the operator now can operate the gun remotely, taking advantage of the best view of the fire. All of this can be done safely without anyone

climbing to the top of the truck, as well as freeing that firefighter to accomplish other important duties.

The need for higher flows in foam operations is also a consideration when reviewing fire streams management capabilities. Even at the local level, pre-planning for a department's response to a domestic terrorism incident continues to take on importance of dramatic proportions. Certainly, in our free and open society, there is no way that we can identify all aspects or potential threats of a terrorist act, but many of the scenarios rely on a department's ability to provide large, uninterrupted supplies of water or foam for sustained periods of time.

Untold opportunities for potential domestic terrorism involve flammable or poisonous liquids in both fixed storage and processing facilities, being transported via rail tank cars, in over-the-road tankers, or moving through jurisdictions in underground pipelines. As many fire departments are under-equipped and often inadequately trained to supply sufficient foam firefighting streams, many agencies have chosen the flexibility of having a self-educing foam nozzle that can be used on the deck gun of an apparatus, or portably on a small monitor. Having a simple, reliable delivery system and an adequate supply of foam concentrate can help any department improve its overall response capability to high hazard locations.

Finally, by initiating an aggressive attack utilizing a pre-piped master stream device or a portable pre-connected monitor, you can attack the fire using your total capabilities. As long as the device and stream are carefully and accurately placed, and personnel operating the devices are mindful of the method of attack being used, the results will typically be successful. If, on the other hand, all components of your high flow initial attack were initiated properly and the fire still surpassed your ability to suppress it, there was probably little else you could have done.

Remember – Big Fire = BIG WATER

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Specifying Fire



A typical fire alarm system has a life expectancy of ten to twenty years; therefore selecting a fire alarm system for a property is a decision with long-term significance. The life of the fire alarm system in a particular facility begins once the system installation is completed, accepted by the building owner, and approved by the local authority having jurisdiction (AHJ). Since the system life span is at least ten years, many factors must be considered when specifying a fire alarm system that will best meet that facility's needs.

By **Peter J. Ebersold**
and **Trista A. Budd**

Honeywell

Building Type and Usage

The importance of each factor when specifying a fire alarm system varies depending on the type of property that the system is protecting. For example, a system that is appropriate for a warehouse that is unoccupied most of the time is most likely not the ideal system for a luxury, high rise hotel or a residence hall at a university. Key to successful fire alarm system design is knowing the building usage as well as occupancy levels and occupancy schedule. The facility type will drive the fire system requirements for life safety, critical asset protection, general property protection as well as potential detection environment challenges.

Detectors versus Sensors

Detectors were the predecessors of sensors and for many years only detectors existed. A detector has all the processing logic built into the device electronics to make the decision about a fire condition. A detector makes the fire decision and communicates the decision to the fire alarm panel. A sensor on the other hand, is a sampling point measuring ambient conditions and reporting those conditions back to

the fire alarm panel. The fire alarm panel then makes the decision whether the conditions reported by the sensor represent a fire alarm based upon pre-programmed algorithms in the panel.

Sensors brought many advantages not available from detectors into fire alarm systems; the most significant being sensitivity adjustment by point. Each sensor can have a customized level based upon the environment in which it was installed. This can result in a significant improvement in the level of life safety and a reduction of nuisance alarms in buildings.

Another important feature introduced by sensors is drift compensation, where the alarm values are slowly adjusted by the fire alarm panel software according to the average chamber value of the sensor. This is used to measure and adjust for the sensor chamber becoming dirty and to send a signal to the panel when a sensor needs cleaning. Sensors also initiated sensitivity levels selectable by the time-of-day and day-of-week. Sensors can become more sensitive during hours buildings are not normally occupied and less sensitive during hours of occupation. This can also reduce nuisance alarms while creating quicker response to fires when

Alarm Systems

the buildings are not occupied.

The bottom line is there are significant differences in detectors versus sensors for designers and facility owners. Understanding the differences is important to the design, installation, programming and operation of the fire system.

Specialty Sensors

Until recently, the choice when considering the selection of fire detectors for a facility was limited to single type detectors. A particular detection technology would be utilised either to detect the most likely fire scenario, or it would be chosen because other detector types could not be installed because of environmental conditions that cause false alarms such as dust and high humidity.

Where the fire detection system requires either advanced sensing or has problems with false alarms from a single sensor in specific situations, then a multi-criteria, multi-sensor is the preferred device. The combination of multiple sensing elements offers the highest performance practical with today's technology for use in facilities that are high risk or have a high cost of down-time. In these applications, the slightly higher increased cost of such detection products is worthwhile due to the lower cost of downtime and business disruption caused by false alarms.

One example of multiple criteria sensing is the combination of smoke and heat in a single device. The fire panel responds to the heat element differently than the smoke element. This function is useful in cases where the response is different to a smoke alarm versus a heat alarm. A prime application is hospitality – hotels and motels where guests may be smoking in their rooms. The smoke element can be set as a pre-alarm, where a signal can be transmitted to the front desk to send people to investigate, without sounding the general alarm and avoid disturbing the other guests. At the same time, by the use of a sounder base on the smoke sensor, a local alarm in the specific room can be sounded. However, unless the temperature in the room rises sufficiently to activate the heat element, the general alarm is not sounded.

Another multiple sensor detection device now available is a combination Carbon Monoxide, Photo-Thermal, Infrared analogue addressable detector. This device offers advanced user configurable sensing, with a unique combination of detection technologies. The resulting benefits are unsurpassed nuisance alarm immunity and rapid response times for most types of fires, including 'fast flaming'. These new technologies of multi-criteria sensing are changing the concepts of how fire alarm systems are designed, making them more powerful and more responsive.

Stakeholders in Fire System Decision

There are many stakeholders involved in the decision making process that goes into specifying a fire alarm system. Among the stakeholders are the building owner or his facility manager or building engineer, the general or electrical contractor who is building or renovating a structure, the fire alarm manufacturer's branch office or local authorized distributor, an Architecture and Engineering firm, a Fire Protection Engineering (FPE) consultant, and the local AHJ. Each of these groups may have various



priorities and concerns which may impact the schedule or cost.

At a minimum, the building owner always wants a system that will meet either a local fire code or a national or internationally recognized code that is acceptable to the AHJ. Since a building owner is generally not an expert in fire alarm or life safety systems, they often rely on the expertise of outside personnel to make certain that the system meets local codes and their unique needs. Some building owners, particularly those who have high value properties such as Class A office space, residential buildings, or high risk facilities such as airports, petrochemical refineries, or semiconductor manufacturing plants may be willing to spend more money for leading edge technology that improves false alarm immunity, decreases the time between detection of a fire and sounding the alarm or adds functionality that is not required by code. As an example, a building owner may request a voice evacuation system to instruct building occupants during an emergency even though the local code does not require a voice evacuation system for that occupancy. It is only after a building owner has lived with a fire alarm system for a few years that they completely understand the benefits and potential limitations of the system. However, if the building owner stays involved with all aspects of the fire alarm system discussion, bid and installation process, they are most likely to get the system that best fits their facilities' needs.

The general contractor or electrical contractor is focused on finishing the project within a specific schedule. Their goal is to minimize schedule impacts. A more complicated fire alarm system with special requirements will generally take more time to install or test. Having the contractor understand a system's complexity and special installation requirements will give them a better idea of how long the installation will take.

Building owners with large, complicated projects or special requirements will often hire an independent Fire Protection Engineering (FPE) consulting firm to recommend or design a fire alarm system. The FPE firm may interview fire alarm vendors and/or their local authorized distributor about their capabilities for a project. The FPE firm will then



recommend a particular manufacturer's system to the client or the FPE will prepare a bid specification that the building owner can use to solicit distributors for an installation and test.

An architect is often concerned with the aesthetics of a system. These aesthetics can include the appearance of the notification appliances, whether the smoke or heat detectors will detract from the room's appearance, the placement of the fire alarm control panel and its visibility to the building tenants.

The AHJ requires that the system meets appropriate codes, however they may have their own unique requirements that factor in the local differences such as extended battery backup for areas where power outages or severe weather are common. When the stakeholders have all agreed on the system requirements, the fire alarm specification can go out to bid or be awarded to the fire alarm distributor for installation, testing and acceptance. A well designed system will install quickly. It also builds credibility for all involved that the design considered all system requirements.

Total Life Cycle Cost

Another important consideration in the fire alarm system selection process for any building owner or facility manager is the total life cycle cost of a system. While the initial system hardware and installation costs are important in determining who to award a system installation contract to, the annual recurring cost for inspections, testing and normal maintenance are also important. Service and maintenance costs over a five to ten year period can be more than the initial installation expense. To better understand annual recurring costs, the building owner should require that each potential bidder or installer include a service agreement for a defined period of years as part of the bid package. Service agreement components to consider include the following: yearly test and inspection, written reports completed after each maintenance visit that outlines exactly the services performed and coverage for routine maintenance such as smoke detector cleaning and spare parts once the manufacturer's warranty expires. Another important factor is

whether after hours visits are covered or if additional charges for work after normal business hours are incurred. By reviewing annual costs before the system installation contract is awarded, the building owner can understand what the true life cycle cost is for a particular manufacturer's system. Depending on a facility's budget structure, it may be easier to justify a higher up-front cost rather than a significant annual maintenance expense.

Other key questions that a building owner should research include:

- Are smoke detectors, remote annunciators, etc., backward compatible?
- How long has the proposed system been on the market?
- Are references available for similar type projects?
- Are their multiple sources of spare parts in a particular city or region?
- Is the fire alarm manufacturer willing to train the building owner's representative on fire alarm system operation? What is the cost of a training class?
- Is the fire alarm system non-proprietary?

In a non-proprietary system, where the manufacturer will share the password with the system owner, the building owner may be able to choose between several service providers. This is a winning situation for the building owner as a means to keep their service costs reasonable. In addition, it gives the local branch or distributor the incentive to service that account well.

Summary

A fire alarm system is an essential element of any new construction or retrofit project. While the fire alarm system is not obvious in the same way a roof, walls, windows or elevators are, it is critical to the safety of the building's tenants, visitors and service personnel. Cooperation between the different groups involved in the design, specification, bidding, installation and inspection of a fire alarm system is vital to a well designed, trouble-free installation that will function properly over many years. The peace of mind that the building owner receives knowing they have the best fire alarm system they could buy is priceless.

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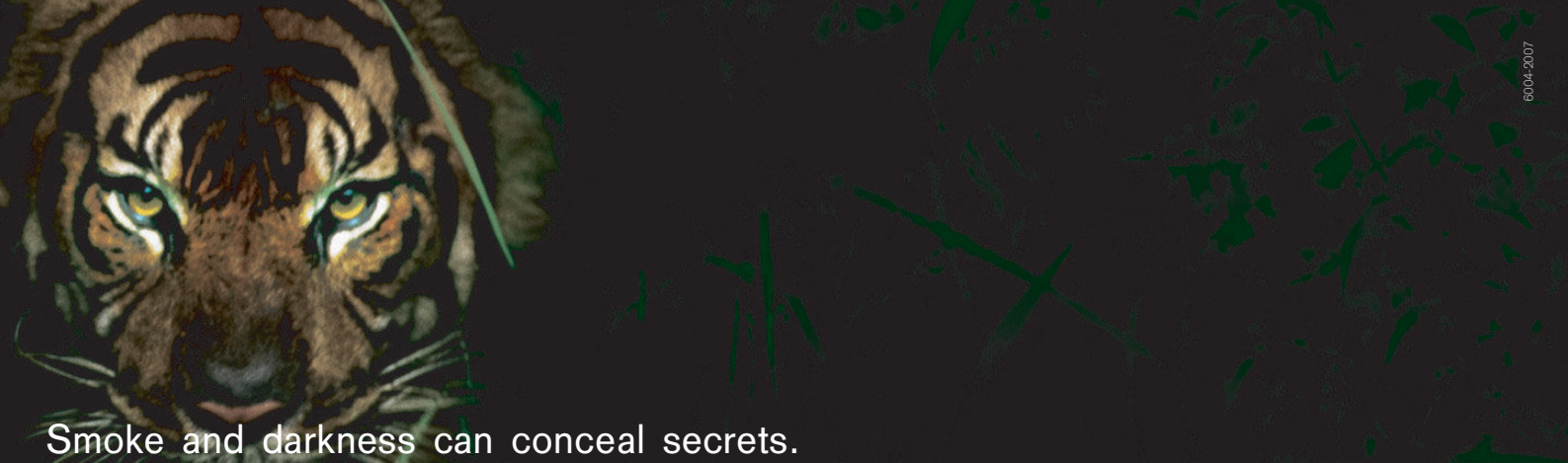
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Taking a Modular Approach to SCBA

With more “whistles and bells” than ever before, modern day self-contained breathing apparatus (SCBA) is no longer a device that “simply” allows someone to breathe. Instead, it now plays an integral role in the safety of firefighters by offering better protection than ever before and transmitting vital data to their colleagues about real-time operational conditions as well as their own individual status. However, not every situation requires the same breathing apparatus functionality and how can something so technically advanced be designed to suit the needs of every application? The answer lies in one word, “modularity”.

By Gerd Pearson

Draeger Safety UK
Limited

In fact, the overall safety of professional firefighters has taken on a whole new meaning with the development of innovative modular systems that can be quickly and easily adapted to suit a particular “shout”. Placing the emphasis on usability, performance and comfort, these new systems can be linked together to meet the exact needs of today’s firefighters – as well as their needs for tomorrow.

For the first time harnesses, face masks, helmets, communications and telemetry can be selected to offer the utmost protection against specific hazards and/or exceptional circumstances. In addition, the effortless assembly and disassembly of each of the major components means that not only can the BA be configured rapidly, but easy care and maintenance will guarantee quick turnaround times in the workshop and, as a result, ensure that the breathing apparatus is always ready for use.

The start of a revolution

Back in 1990, in anticipation of the new PPE Directive, EN137, Draeger Safety seized the opportunity to develop a new type of CABA. With the standard as a guide, the company made the decision not to simply amend existing sets but, instead, undertook extensive research to find out exactly what firefighters needed. As a result, Draeger has been able to revolutionise the design and effectiveness of BA way beyond the basic requirements and lead the way, technologically, well into the future.

For instance, the burden of weight on the back is something that every firefighter has to contend with. Following studies with the Rotterdam Fire Brigade to determine the most effective method of weight distribution and body mounting of BA sets, Draeger found that it was able to significantly reduce the likelihood of back injuries by minimising

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the stress on the body. In Addition, following careful consideration of a study of anthropometrics, Draeger also added a height adjustment feature to the backplate.

Recognising that BA is worn in dynamic applications where firefighters are required to move, bend and stretch, a sliding/pivoting waistbelt was introduced to ensure free movement and allow for up to 80mm of spinal stretch. Knowing that, before anything else is taken into consideration, the average firefighter is required to carry 3 kilos of compressed air, Draeger also took the opportunity to reduce cylinder weight. Lighter than traditional versions, carbon composite cylinders were developed and are now available in a number of different formats and configurations to suit different requirements. (In fact Draeger is still the only breathing apparatus manufacturer to make its own carbon composite cylinders.)

By the late 1990's, and still listening to its customers, Draeger launched the next phase of fully integrated CABA: electronic monitoring. This saw the introduction of the DraegerMan Bodyguard and, five years later in April 2002, the DraegerMan Bodyguard II.

Easy to use with simple push-button controls to provide fast access to essential information, Bodyguard offers a host of previously separate warning and monitoring devices within a single instrument.

For example, amongst other things, this advanced data storage unit can indicate how much air is left within the cylinder and, by calculating the current rate of consumption, will advise the firefighter how much time he or she has left. In addition, it can provide a temperature reading and act as a distress alarm if a firefighter becomes trapped. If a firefighter is unconscious and cannot move, it will, after a pre-determined time, sound an automatic alarm which is both visible and audible.

The availability of electronic monitoring also brought about the dawn of telemetry. Developed by Draeger and launched as the first system of its kind, the PSS Merlin takes the guesswork out of entry control and accountability procedures and brings a new level of monitoring and protection to firefighting applications.

Fast and accurate, it incorporates an entry control board, the DraegerMan Bodyguard and a portable radio unit attached to the firefighter's BA set. Using radio technology to continuously transmit and receive data from up to 12 individual firefighters simultaneously, this self-contained, state-of-the-art electronic system is able to remotely monitor their exact status and safety from outside the incident. Put simply, the Entry Control Officer (ECO) sees exactly what the firefighter sees in terms of Bodyguard information.

Unlike traditional manual or semi-manual systems where the ECO knows the time of firefighter entry but can only estimate the time out, the PSS Merlin provides ECOs with a continuously updated supply of vital information. Enabling them to react immediately in an emergency, this also assists with the planning of relief teams.

Meeting the requirements of TB1/97 and JCDD40, the PSS Merlin control board is based on the standard UK control board with additional electronic displays. Fully automatic and able to support rapid deployment procedures, it provides one continuous display channel for each firefighter simultaneously, with full manual back up if required. In addition to the time that the firefighter is due out (based on time remaining), up to six parameters can be seen by pressing the information button – the brigade can choose which parameters and the order in which they are shown. Data logging is also possible for post-incident analysis.

An added bonus is that the radio acts as a complete slave to the Bodyguard which means that the firefighter can forget about it – there is no need to tune to the right channel or to press transmit or receive buttons. Repeaters can be used in circumstances where signal transmission may be impaired such as in underground tunnels.

The latest developments

Forming part of a revolutionary, complete system solution from Draeger Safety, the innovative Draeger PSS 7000 Breathing Apparatus (BA) has been developed by professionals for use in even the most hostile of environments. Modular in design, it can be easily and quickly configured to suit different operational requirements and provides seamless integration with facemasks, head protection and communications equipment.

Easily upgraded to meet future needs, the Draeger PSS 7000 is the latest development in Draeger's ongoing commitment to the provision of world class breathing apparatus and incorporates tried and tested pneumatics as well as the most advanced materials. Bringing greater confidence to users by combining the very best ergonomics with reliability, durability and safety, it also offers easy care and maintenance. In addition, the Draeger PSS 7000 combines a wide range of features to maximise comfort and minimise both stress and fatigue, and is ideal for use with personal monitoring and/or telemetry systems.

The new harness, for example, features advanced compression moulded comfortable padding that combines high temperature performance with exceptional wear resistance. A high grip, anti-slip surface ensures that the harness stays in position and the set remains secure on the body, whilst a quick release mechanism on both the waistbelt and shoulder harness allows quick and easy detachment for easy cleaning and maintenance.

Adjustable and robust, the new heavy duty stainless steel strap buckles ensure long life and easy operation when donning and doffing, and the shoulder pads and waistbelt both feature a new quick release mechanism for easy maintenance. As an added benefit, the new hose sleeves on the shoulder harness are covered with reflective material to increase visibility and, at the same time, provide additional hose protection and minimise the risk of snagging.

Featuring 3-point height adjustment, the light-weight, high strength carbon composite back plate incorporates further integral hose channels to eliminate snagging and offer improved protection. Large carrying handles have also been integrated for better handling and safety, and a new slide and swivel waistbelt mechanism ensures correct positioning on the body during donning. The first stage pressure reducer has also been fitted with a quick release mechanism for easy maintenance.

Also designed with the needs of firefighters in mind and fully compatible with the Draeger PSS 7000 BA as well as the Draeger HPS 6200 Helmet, the new Draeger FPS 7000 Full Face Mask forms part of the same revolutionary, complete system solution from Draeger Safety. Developed as a result of user consultation and representing a new standard in terms of safety and wearer comfort, it combines the very latest ergonomic design with a large field of vision and a secure fit that feels both comfortable and natural to wear. Offering more flexibility than ever before, with a wide range of modular, integral accessories, this robust, easily maintained mask is also available in a variety of sizes.

Available with either a hypoallergenic Silicone or EPDM mask body for optimum comfort, the mask features a distortion-free polycarbonate visor and offers an exceptionally wide field of vision. An innovative design optimises the air circulation within the mask to eliminate misting and, in addition, a number of different coatings are also available to meet every eventuality.

Providing an outstanding fit to both the head and face, the ergonomic, double seal of the mask body ensures a secure, comfortable fit for all face shapes and contours. The uncomplicated 5-point head harness also allows the mask to be donned and removed both quickly and easily. In addition, and for those who prefer to use mask-helmet combinations, the new patented 2-point Draeger Q-fix connection, complete with safety button to prevent unintentional release, ensures that the Draeger FPS 7000 can be quickly connected to the Draeger HPS6200 helmet.

Obviously, effective communication is vital to any firefighter. For this reason, the mask can also be supplied with the new, integral Draeger FPS-COM communication system. This state-of-the-art, modular system can be easily adapted to suit specific needs, whether for radio communication or voice amplification.

Maintenance is also quick and easy. In fact, the clever design of these special accessories and the simple maintenance of each of the mask parts ensure that the Draeger FPS 7000 is economical and easy to service as well as being flexible and versatile in use.

Draeger Safety manufactures a wide range of respiratory protective equipment as well as personal escape sets, chemical protection suits and both portable and fixed gas detection systems that are ideal for firefighters. Designed to absorb excess body heat and bring improved comfort to the wearer, the Draeger CVP 5220 Cooling Vest is a typical example.

Ideal for firefighters and those working in high temperature surroundings, it is also particularly suitable for use under gas-tight chemical protective suits as well as in industrial, shipping, mining and blast furnace applications. Unlike alternative cooling methods that require pre-freezing, the Draeger Cooling Vest incorporates a special Phase Change Material (PCM) throughout the garment. Able to reduce the wearers' temperature by around 4°C, it can, depending on the level of physical work and the ambient temperature, provide a cooling benefit for up to 3 hours.

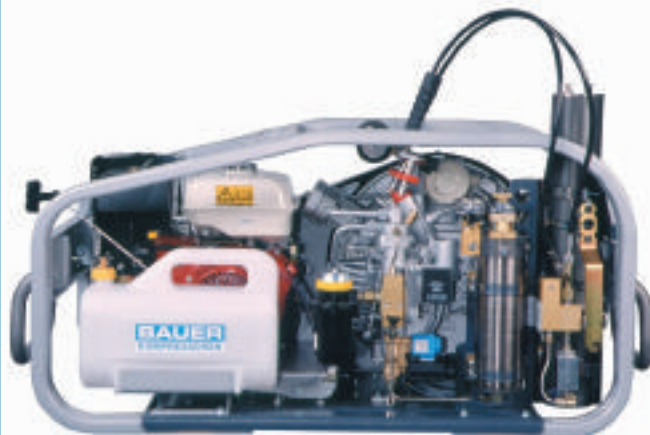
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Heavy Vehicle RTAs

By Erik de Kunder

Senior international instructor, Artesis Academy and

Jack Kusters

Managing Director, Artesis Academy

In this world today, we can no longer move without any transport. They don't say for nothing, "without transport everything stands still". The economy is very dependent on transport and particularly of freight carriages.

If we examine the traffic movement, we see that even there the increase hasn't stopped. More strongly, it seems that on every continent the transport movements are still increasing.

This amount of traffic movement also results in the increase of the number of accidents. Because of this accidents with freight carriages are happening more and more.

As rescue services, we have to deal more and more with the challenge, to give aid to lorry drivers in a fast and safe way.

In the past it was absolutely no problem to cut a lorry open with our hydraulic tools, nowadays we have to deal with bigger challenges.

A very attentive accident is the "head/tail" collision.

Because of the busy traffic movement, the drivers will drive too close together which increases the danger for head/tail collisions enormously.

Certainly a lorry with a total weight of 50 barrels does not stand still at once. As soon as a vehicle like this is involved in an accident, its total weight becomes its largest enemy.

Because this mass has a forward speed, it is simply impossible to slow down at a short distance. And if the driver doesn't respond quickly enough a heavy accident can no longer be prevented. The

driver always tries to bring himself into safety. This is a completely natural response. We frequently see that were there space to survive the accident, that this is space where the driver is sitting.

If we look at the improvements which the vehicle industry applies on the freight carriages, we see more and more safety and security systems that are protecting the people inside. An important change is the application of firm and harder steel in the cabins.

To make the so called "cage construction" more safe, the following steel sorts are being used to reinforce the cage construction: High strength low alloy (HSLA), Micro-alloy, Boron and Ultra HSLA.

The reason this steel is being used is because it is absorbing the energy from the impact. By using this stronger steel, it uses more energy to deform. Therefore this reduction of energy makes it possible for the victims to be able to survive the accident.

This is clearly of influence on the external lesions of the victims and not on the internal lesions (not visible).

This stronger steel doesn't make it easier for the rescue workers to reach the victim inside the cabin.

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It is costing the rescue workers more time and effort to open a cabin with the standard techniques. These changes in the cage constructions however, help rescue workers to develop new techniques.

A large point of profit is a reliable point of attachment for the spreader or ram on the cage construction strengthening points. By using the hydraulic equipment in a different way, there will be more possibilities and more techniques to open the cabin.

In order to manage several types of accidents there are many tools and appliances available. In our vision there are three different levels of tools that can be distinguished. Light, middle and heavy hydraulic tools.

The category 'light' contains tools such as combination spreaders and small rams. The combination spreaders and small rams should belong to the standard equipment of each fire fighter vehicle. These tools can be used for forcing an opening for both buildings and vehicles. If we only focus on vehicle accidents there are some restrictions to these tools.

In order to install the light hydraulic tools on a first fire fighter vehicle there is one condition that must be followed. Assistance of middle-heavy or heavy tools should be available within a short period of time. A short period of time is defined in Western Europe between 15 and 30 minutes. If this condition cannot be guaranteed, the middle-heavy tools should be available in the first action. The main point is that with the light category tool at a car accident, the tool must be able to open a door and remove a roof. There shouldn't be any doubt about the capacities of the light category tools, but for example the spreader opening and the cutting possibilities of the combination spreader are somewhat more limited than

the spreaders or cutting equipment.

The combination spreaders are further developed and are improving their possibilities more and more. Particularly the quick removal of the spreading points, turns the tool into a fully approved cutting equipment.

The maximum opening remains a point of interest. The middle-heavy category tools contain the spreaders, cutters and rams that can make a larger opening or have a stronger cutting power.

Moreover is in our perception the tension free cutting is the most important point for choosing the cutting equipment and it is subordinate to the cutting power such as is described in the folders.

With the middle-heavy tools it is possible to tackle more complex incidents with cars and light freight carriages. The larger openings which can be made in combination with more power, give the rescue workers more possibilities to save victims rapidly and adequate.

The heaviest category hydraulic tools are being used for example in incidents with trucks, trains and collapsed buildings. This category tool is also used at earthquakes and such.

Characteristic in this category is the extreme power which can be displayed by this tool. Rescue personnel must realise themselves that the tool can also have an enormous powerful response, after all action is reaction.

In the different types of incidents the different tools can be used. At complex incidents you frequently also need smaller tools from the light category. Then these tools are used for example to make openings, where after larger and heavier tools can be used. Which tool will be necessary for your brigade is difficult to say.

Closer study into the working circumstances and types of incidents is necessary. Particularly the working circumstances are important to examine. Concerning the hydraulic tools it is important to know that climatological circumstances have a strong influence on the performances of tools. Surroundings temperatures could be responsible for the capacity decrease of the tool. In a next number of APF we will present an comparison model for hydraulic tools.

Education and training

In any rescue operation, especially in heavy rescue training is essential. Having the adequate equipment will bring nothing, if not correctly applied. Changes in the car industry already have lead to the results that for accidents with cars and MPV's/SUV's a total of 16 techniques can be applied.

In this segment of the rescue aid, Artesis Academy from the Netherlands has developed a skilful pocket notebook where these techniques can easily and step by step be carried out. The pocket notebook is part of a 1-day elementary course ART™ (Artesis Rescue Technics) and a 3-day advanced course of a person vehicle. For the 2-day follow-up course, the heavy RTA course, is also a skilful pocket notebook with all points of interest and techniques is available.

During the training the different subjects concerning the heavy RTA for freight carriages and buses will be addressed to. There will be extra attention for the subjects kinetic energy, the accident mechanism, danger indication and the



different safety systems and their impact.

The practice course is aiming at rescuing from and handling the mass of freight carriages and buses. Attention also lies in managing larger accidents with several victims. Training is done on location or in one of our training locations in Europe.

Appliances

In order to rescue the victims after an accident, other appliances are also necessary beside the

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mentioned tools. Depending on of the type accident several appliances can be used.

For example we mention stabilisation materials like cribbing blocks or complete scaffolding appliances. For accidents with trucks are rapidly build up scaffolding is a good alternative. This makes it possible for the rescue worker to work on altitude and carry out a justified rescue. This in order to prevent that rescue workers must stand on ladders or have to work with tools above their head. That is irresponsible.

Stabilising for example a truck is asking for particular attention. This in order to prevent the wreck from moving during the rescue action. This is often a complex task for the rescue workers. Different than with cars, trucks have 4 points of attention for stabilisation. In order for a fast and adequate action, the rescue workers must have additional materials. Certain stamp systems are being used here, which can bridge a larger



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altitude/distance concerning the stable situation. These stamps must have sufficient carrying capacity towards the weight which they must support.

Another solution can be found in the so called NT-Bags. These connectable high pressure lifting cushions offer the possibility to a rapid and adequate stabilisation of larger weights such as trucks.

Besides the above, the lifting cushions are extremely suitable to use at collapsed buildings after for example an earthquake. The NT-bags have the advantages of a high and low pressure lifting cushion in one. The lifting height of the low pressure lifting cushion and the capacity and stability of high pressure lifting cushion.

Because the cushions can be connected to one another, large altitudes can be overcome without endangering the stability. The last is important for a safe working environment for the rescue workers. The lifting cushion is therefore a fully approved tool for the rescue service.

What is noticeable however, is that rescue workers do not really know what they can do with the lifting cushions. This is why we are busy at this moment to develop a method for the use of lifting cushions. Also on this subject we will return in a next number of APF.

APF

Writer of several books and articles and training all over the world **Jack Kuster** is an expert in extrication and rescue in general. Many tools and equipment that we use now for extrication is started as a brainwave from Kusters, where manufacturers have translated the idea into a useful product. At the beginning of the 90s he developed a new system for extrication for the Dutch emergency response services. This became known as the "Kusters" approach. Now Kusters is managing director of Artesis Academy. Email: j.kusters@artesis.nl

Erik de Kunder become instructor out of the ambition to improve extrication mostly, by developing new techniques and training materials. He has instructed many rescuers around the world, and several techniques are developed and improved by Kunder. He is now a senior instructor at Artesis with focus on training international teams. Website: www.artesis.nl

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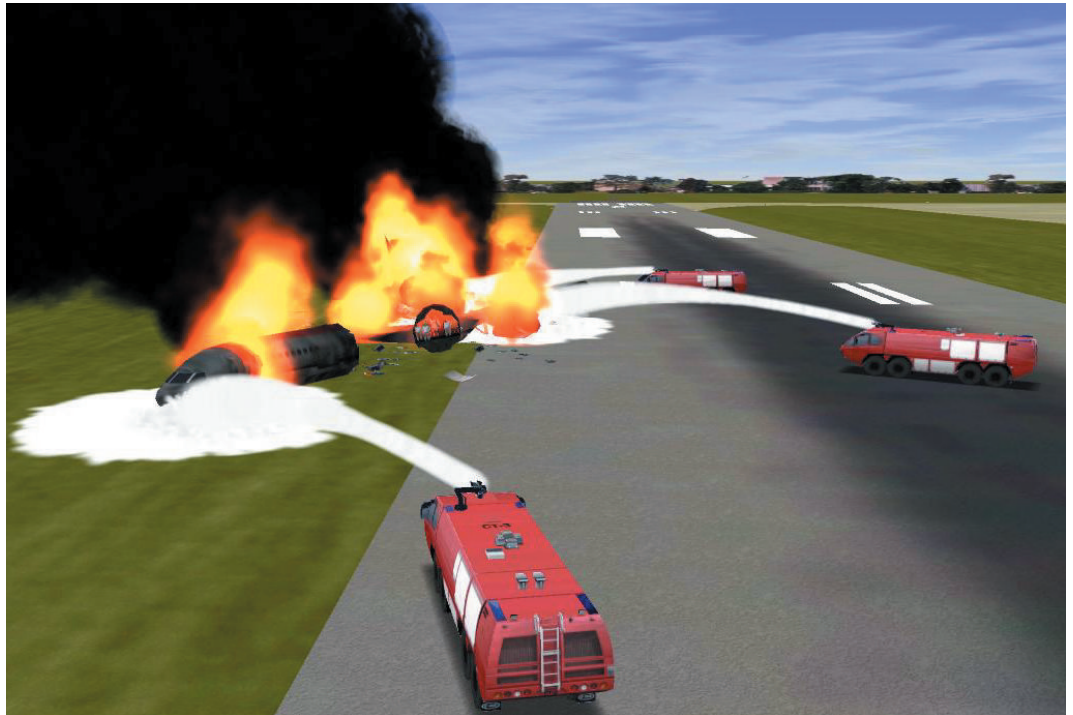
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Use of Simulation Truck Driving an



The crash truck is the key asset of the Airport Fire and Rescue Service (ARFF). Safe and adequate driving and operating is essential to ensure the full use of the fire fighting capabilities when it is needed at live incidents. Its particular extinguishment capacity, speed, acceleration and dimensions characterize a crash truck. These characteristics make it a special vehicle that requires proper and careful use by its crew.

By **Marco van Wijngaarden**

ETC Simulation

Unfortunately, as in normal traffic, incidents do occur whilst driving, training and at real incidents. It is also known that vehicles are not always used effectively at live incidents. The result of inadequate training, familiarization, experience or carelessness is often damage to property, but also results loss of lives. Well known results of poor preparation are: vehicle roll over, being stuck in soft terrain, improper/inefficient operation and hitting casualties with vehicle and jet stream. How can such things happen with all of the existing methods for preparation such as classroom education, daily driving and frequent live training? When we look closer at what we are doing we should ask ourselves the question: How can we do better?

My presentation is about the way education and training of ARFF can be improved by the use of simulation. I will not provide a ready-to-use solution. It is my goal to look at training for CT-crews from a different perspective to contribute to optimal preparedness for ARFF.

The topics I will cover are: Educational side, Context of the job, Live fire training and Simulation. I will then review in a conclusion.

Educational side

In the past years we've seen some interesting educational developments that can be used for ARF. A new trend is called New School Learning. When we compare Old School and New School Learning we see the following characteristics:

Table 1: Old School and New School Learning

Old School Learning	New School Learning
Teaching content	Learning processes
Classroom focused	Workplace focused
Teacher centred	Learner centred
Inactive working forms	Active working forms
Belongs to training department	Belongs to each person
Activity centred	Outcomes based
Training Specialist	Learning Consultant
Planned learning	All day learning

New School Learning is mainly based on the learning theory of social constructivism. Social constructivism is a concept that says that learning

n for ARFF Crash d Operations

takes place in context with the (social) environment. A direct consequence is that the learned skills will be more automatically applied in live situations that correspond with the training situation. This means that the learning environment must match as much as possible the practical situation where skills will be applied. Because learning is a social process it continues always, in school and beyond. We simply cannot stop learning, and most learning takes place outside school or training hours. It is hard to plan and orchestrate the learning process because it requires some conditions. One of them is that you can only learn in the next zone of development. It is like a ladder in that you cannot climb two or three rails further than you are. You have to build further on existing skills, step by step. Another point of interest is that people learn in different ways.

Renowned American educational theorist, David Kolb researched this and his theory about learning styles is well known. Kolb's learning theory defines four distinct learning styles (or preferences), which are based on a four-stage learning cycle (which might also be interpreted as a 'training cycle'). In this respect Kolb's model is particularly elegant, since it offers both a way to understand individual people's different learning styles, and is also an explanation of a cycle of experiential learning that applies to us all. Kolb includes this 'cycle of learning' as a central principle his experiential learning theory, typically expressed as four-stage cycle of learning, in which (1) 'immediate or concrete experiences' provide a basis for (2) 'observations and reflections'. These 'observations and reflections' are assimilated and distilled into (3) 'abstract concepts' producing new implications for action, which can be (4) 'actively tested' in turn creating new experiences. Generally speaking, we see that operational fire fighters can be found dominantly within two learning styles: Accommodating (Doing and Feeling) and Converging (Doing and Thinking). Both share active and experimental learning. This implicates that the training circle ideally should start in one of these two learning styles: experimental learning. But also that we should ensure that we cover the two other styles as well to make implicit training experiences explicit, and achieve optimal training results.

A third point is that different teaching formats have a limited tenability. Active formats are more efficient than passive ones. For example 'Listening' has a retention level of 10% while 'Experimenting' yields 90%. A fourth point is that we know that people are able to connect various learned elements when they know the context and know the connection. Which means that one can train in smaller elements (modular) at first, and integrate the elements into larger elements or the whole system. To conclude, we know what conditions are required to gain the best training results. A very important factor is that we have high expectations of the trainee.

This implicates that we have to set our professional standards. Further relevant, is a well organized training organization and a safe (social) learning environment with opportunities to



experiment. The conclusion that I want to make is that the ARFF should be educated and trained in an authentic training environment. This requires that the learning environment can generate those stimuli that are relevant to elicit realistic behaviour of trainees. It speaks for itself that the stimulus must be noticeable by the trainees, otherwise training is of no use. The design of training programs must ensure that the context ("how does this work in live incidents, what is my role?") is clear for the trainees, so one can train modular in smaller elements with appropriate training formats with options for experimenting. The modules can be integrated into larger elements or complete exercises. And we should organize our training in that way that our people can learn at their own pace. Also we should make them aware of their own responsibility for learning. They have the right to good preparedness and on the other hand they have the responsibility to prepare themselves adequately. New School Learning is teamwork and requires a positive approach by training staff.

Context of roles

In examining ARFF operations at an aircraft incident at the level of a crash truck, we find three roles that can be integrated depending on the local operational strength. We have the crew commander, driver and crewmember. For this paper I will concentrate on the crew commander and driver. Important contextual factors are: unexpected events, unknown situations, response time, and life threatening situations. The key tasks that have to be fulfilled by the crew commander are: command, control and communicate and for the driver: drive, position and operate. In addition, the vehicle must cooperate



with the other responding vehicles. Due to the lack of time, a portion of the operations has to be carried out in an automated manner. These are the pure motoric skills like operating the correct buttons in the correct order. All other skills are more related to knowledge and insight and are cognitive operations.

Time pressure, and unexpected and unknown situations result in stress. The available time is almost always underestimated, which makes people experience even more time pressure. Another factor is that we filter information inappropriately under severe stress. The result of too much stress is that the capacity to make judgements in a proper manner decreases. When we prepare vehicle crews for handling standard situations as well as exceptions to the standard we increase capability and decrease uncertainty, and they will experience less stress. Better decisions are expected when we have optimal preparation. Now we will look at decision-making under time pressure by using the concepts of Research Psychologist Gary A. Klein and Cognitive Research Scientist, Professor Jens Rasmussen. Klein researched decision making under time pressure by experienced professionals. His conclusion is that – in opposition to the rational decision making model – professionals rarely compare alternatives to make the best choice. It seems that they assess the situation, and based on their assessment they select the most proper decision (so not per definition the best). This model falls apart in three steps.

1 Situation recognition: the decision maker recognizes the situation as known or new. With a known situation comes a known solution, with actions that are frequently used or trained. An unknown situation requires unknown actions. Recognition happens on the basis of some indicators and causal developing steps that explain for the decision maker as well as the existing situation as the expected development of the situation. Based on this, the decision maker sets his achievable goals and selects an appropriate action as follows:

2 Serial comparison of alternatives: relying on his experience, he develops a set of alternative actions that can lead to the intended goals. The order of

these alternatives is determined by the extent in which they were used successfully in previous, similar situations. To examine if an alternative is appropriate, the decision maker uses:

3 Mental simulation: the set of actions are simulated mentally to see how they will work and affect the situation. The decision maker will do this only for the first alternatives on his list. When an action seems to work he will select it, even when it is not an optimal solution.

Recognition drives decisions according to Klein. This implies that a decision maker must have a wide experience – a ready to use mental library of situations and solutions – to be prepared for his task.

Rasmussen's research concentrated on mistakes made within decision-making. Based on his research the distinct three types of decision-making are: skill-based, rule-based and knowledge based.

1 Skill-based. The decision maker reacts directly and is almost unaware of the situation. Examples are simple motoric skills, such as driving and putting on a breathing apparatus.

2 Rule-based. The decision maker's response is based on well-trained automated rules. This type is very close related to skill-based. An example is driving upwind and using foam on fuel spills.

3 Knowledge-based. Decision making based on knowledge. When a situation is new, one must think about the situation, goals and alternatives. For example incident command.

When we use these three types to look at a crash truck crew we see that the driver mainly works and decides at a skill-based and rule-based level. This requires a high frequency of repetition of training his task elements. The crew commander works mainly rule-based and knowledge-based. Because his decisions are made under time pressure, his training must be aimed at situation recognition, expansion of the capability for mental simulation and internalization of best choices. The larger the solution-database of a crew commander is, the better decisions you can expect. This demands variation in training of incidents with stimuli that normally will drive the decisions.

Thorough after action reviews are important to improve mental simulation and also to provide a good understanding of time/tempo factors. This training has to be supported by two – and three dimensional visualizations. The crew can train individually, but should also train as team. The types of decision-making can be translated to an educational approach on three levels of training objectives: Motoric, Knowledge and Insight. Table 2 shows the models of Klein and Rasmussen in relation to the training context.

Table 2: Educational Implications Klein and Rasmussen

	Motoric	Knowledge		Insight
	Internalization	Situation Recognition	Internalization	Internal Simulation
Driver	Doing	Seeing	Doing	–
Crew Commander	–	Seeing	Doing	Seeing
Team	–	Seeing	Doing	–

Live fire training

Legislation on training states that there should be a plan and program for sufficient and frequent ARFF training. But what is sufficient? What is frequent? These questions are hard to answer. The overall goal is that the organization and individuals are ready for their tasks. And how frequent does one need to do live fire training? What are the conditions for this type of training? To what extent should we train multi-agency operations? When we look globally at the way live fire training is organized we see that it varies from daily to yearly. In many cases such training is about a standard operating procedure with one to two crash trucks on a training rig with a fuel spill fire. We see training rigs that look very realistic and we see some that are nothing more than a fuel burn pit with some steel tanks, containers and even cars. Training staffs add variation to the training by changing some factors in the scenario. Such live drills are an example of drilling the standard, where 'Motoric' and 'Knowledge' are trained for the 'Doing'-part only. Without the necessary variation parts of 'Seeing' and thus a part of 'Knowledge' and the whole of 'Insight' are not trained. Live fire training has its educational limitations.

Furthermore, we know that the methods and extent that live fire training can be executed depend on safety as well as environmental legislations, organizational limitations and budget constraints. Especially when we cannot use real foam as we see with propane fuelled installation the learning effect is limited. This also counts for training on too small burn pits, rigs that don't look at an aircraft at all or with other types of fuel. On the other hand we see that computer controlled propane fuelled installations have excellent educational capabilities due to the variation and controllability of scenarios. Of course live fire training is essential and useful. However the learning value is not as much as we expect for all roles on the crash truck, because we tend to train for standard situations only. And when one train only one or two times per year, the level of experience can be indicated as average to poor.

My conclusion is that live fire training is essential to maintain a good level of proficiency. Well designed training installations in combination with good training curricula and staff can offer the necessary training variation. The educational effect of live training is in some areas not as good as we would expect. Live fire training has drawbacks: it is expensive; it is polluting and contributes to global warming. The latter two are becoming more and more unacceptable.

Simulation

In essence, live fire training is also a simulation: a representation of a real situation. In this paragraph I will discuss computer simulation. Computer simulation has been used for decades to prepare professionals for their jobs and is also not new for the fire service. Many countries already use one or more types of simulation like e-learning, multimedia, driving, (table-top) incident command and control. I would like to take a closer look at simulation that is useful for ARFF crash truck training in conjunction with live fire training. First we will examine functionalities of this kind of simulation, which I have divided in three types: algorithmic (AF), transparency (TF) and virtual functionality (VF).

1 Algorithmic. The ability to calculate the effect of trainees' actions and decisions on the situation. For example, the development of a fire or the rescue of a casualty including its health.

2 Transparency. The ability to expose the learning

process. With this capability, one can look at all actions afterwards to have intensive after action reviews. It also informs trainers about the progress of the trainee.

3 Virtual. The ability to visualize a realistic representation of the situation. It is important to have all relevant stimuli incorporated that are related to the training objectives.

The transparency functionality is relevant in all learning situations, the other two are not. Table 3 shows the functionalities for the various jobs and learning objectives.

The combination of the functionalities determines the level of authenticity of the simulation, and the level of immersion into the learning environment. The better the immersion is, the more realistic the behaviour of the trainee will be. Immersion is also determined by the way the human sense are

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Table 3: Functionalities For Simulation

	Motoric	Knowledge		Insight
	Internalization	Situation Recognition	Internalization	Internal Simulation
Driver	AF – TF – VF	TF – VF	TF – VF	–
Crew Commander	–	TF – VF	AF – TF – VF	AF – TF – VF
Team	–	TF – VF	AF – TF – VF	–

stimulated through seeing, hearing, feeling, smelling and tasting. These elements and functionalities have an effect on the simulator software and hardware components. The simulator, trainee(s), role-players and training staff together create the training environment. The use of simulation and serious games within education is growing, and authentic simulations are available to use for training ARFF crash truck personnel. The good ones have A-T-V functionalities integrated within appropriate hardware. Hardware goes from standard PC's to realistic vehicle cabins complete with motion platforms. There are even simulators with smell, temperature and wind.

Simulators offer a range of advantages. One can create and train for situations that can barely or never be trained for in the real world. Authentic simulators offer a great learning environment with objective scoring and the opportunity to extensively experiment. Other positive factors are the low costs per trainee, safety, continuous availability and no pollution. To implement a simulation-training program successfully it is important to have dedicated staff that is able to integrate simulation-based training into the existing curriculum. The simulator that I'm using as an example in my presentation is ADMS-ARFF: a crash truck simulator that has been developed to train ARFF crash truck crews in handling aircraft incidents. ADMS-ARFF is designed with the vision that simulation should present authentic stimuli that elicits realistic behaviour. The simulator has the AF-TF-VF functionalities:

- 1 AF:** The effects of decisions and actions are calculated using real-physics.
- 2 TF:** The instructor can score performance. An exercise can be recorded, played back and watched from any position, two- and three-dimensional.
- 3 VF:** The incident is presented in virtual reality. The senses addressed are seeing, hearing and feeling.

For the operation of the turrets, joysticks are provided with all essential functionalities. When ADMS-ARFF also has to be used for pure motoric skills training, a vehicle-specific console can be attached. Because ADMS-ARFF trainees are active and can experiment, we expect to achieve a retention level of 80 to 90%.

The nucleus of this learning environment is a generic airport with three aircraft emergencies. Trainees can respond to these incidents with full operational crash trucks and a water tender. The scenario generator enables the instructor to set up the incident, select where fires will start and adjust weather conditions. Trainee decision making affect

the scenario progression. The simulator is safe, mobile, affordable and easy to use.

Other applications of the simulator include:

- 1** Multiple ADMS-ARFF's can be coupled for team training, including multi-agency activities
- 2** Incidents such as road traffic accidents and building fires can be integrated
- 3** Preparation of and pre-training for large scale exercises
- 4** Evaluation of Disaster Management Plans

Conclusion

New School Learning shines another light on training, as we are used to it. Training situations must be designed in that way that a trainee can exercise authentic behaviour. We can evoke this by presenting the right stimuli in training situations. Learning environments must be attractive and challenging to be effective, and we must serve all learning styles within our training formats. The theories of Klein and Rasmussen show that decision-making under time pressure requires specific training conditions. Live Fire Training has some limitations that will grow due to environmental legislation and social-political effects. These limitations can be solved by the use of computer-based simulators. Table 4 for shows where live training and simulation can be used.

The combination of live and simulation training is very powerful when they are blended in a proper way. As in engineering or construction work: the use of the correct combination tools, in the correct way, will result in the job being completed perfectly. We can do the same with live and simulation training. **It is time to explore new ways of training, and strive for optimal preparedness: to save lives, mitigate damage and save our environment.** **APF**

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Table 4: Options For Optimal Use Of Training Aid

	Motoric	Knowledge		Insight
	Internalization	Situation Recognition	Internalization	Internal Simulation
Driver	Live Training Simulation	Simulation	Live Training Simulation	– –
Crew Commander	– –	Simulation	Live Training Simulation	Simulation
Team	– –	Simulation	Live Training Simulation	– –

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Sprinklers in Warehouses

Warehouses are one of the most vulnerable buildings to large fires. This is because for operational reasons there is pressure not to introduce internal compartments and so there is nothing to prevent fire from spreading throughout a building. Moreover today's warehouses are much larger than those built in the early part of last century. They are also higher, using racked storage layouts, and often carry goods of a much higher value (consider a pallet of mobile phones against a bale of cotton). Readers who have never seen a fire test on a warehouse mock-up are likely to be surprised at the speed of fire spread: it can take less than a minute for a fire to go from ground level to large flames above seven levels of racks.

By Alan Brinson

European Fire Sprinkler
Network

Legislative requirements to fit sprinklers

Fire safety regulators in a number of countries recognised the vulnerability of warehouses to fire and introduced maximum compartment sizes, above which warehouses must be sprinklered. The requirements to fit sprinklers have three aims: firstly to prevent fire-fighter exposure to excessive risks; secondly to limit fire-related emissions and thirdly to protect the local economy.

Regarding fire-fighter risk the authorities in The Netherlands and Germany have determined that a single fire crew can cope with a fire no larger than 1,000m² and 1,200m² respectively. It is therefore not acceptable to design buildings which could present the first responding crew with a larger fire. Although the fire service could decide not to enter

the building they may do so if on arriving they are told that people may be or still are in the building. Thus in The Netherlands if a compartment (in any building) is to be larger than 1,000m², additional fire safety measures are needed to demonstrate equivalence to 1,000m² compartmentationⁱ. In most cases and in almost all warehouses the solution is to fit sprinklers. For the same reasons in Germany the local state building codeⁱⁱ requires sprinklers. That fire-fighters are likely to risk their lives in a fire in a large warehouse was sadly proven when in June nine fire-fighters lost their lives in a fire in a furniture warehouse in Charleston, South Carolina USA. Preliminary computer simulations of the fire development indicate that it spread faster than running speed, so that some fire-fighters were caught by surprise. Others

A rack fire test conducted at the FM Global Research Campus. © 2007 FM Global. Reprinted with permission. All rights reserved



probably died when the roof collapsed. Roof collapse is a common fire-fighter concern in warehouse fires.

France experienced some large warehouse fires which took days to extinguish and therefore introduced a requirementⁱⁱⁱ to fit sprinklers in warehouses larger than 3,000m². The Spanish building code^{iv} explicitly includes the protection of property as one of its purposes and therefore has detailed requirements to fit sprinklers in warehouses; depending on the fire load and adjacency to other buildings sprinklers can be required in warehouses as small as 300m², although for most applications the threshold is 2,000m². Across Europe Austria, Denmark, France, Germany, Netherlands, Norway, Portugal and Spain all have requirements to fit sprinklers in large single storey warehouses, with threshold areas ranging from 1,000-3,000m².

By contrast the new edition of Approved Document B^v, which took effect in England and Wales in April 2007, for the first time introduced a threshold of 20,000m², an order of magnitude larger than in other European countries. Unlike in Spain the scope of Approved Document B does not include property protection, and in the absence of major loss of life in warehouse fires the regulator felt unable to introduce a requirement to protect warehouses with sprinklers. Nevertheless one could ask whether it is reasonable to allow the construction of buildings which could present fire-fighters with an impossible challenge.

Although Approved Document B does not consider property protection, the Government did commission a brief study to determine whether there is an economic case to fit sprinklers in warehouses^{vi}. This study was hampered by a lack of data and relied heavily on warehouse loss data per square metre for 1966 warehouse fires shown in a graph in the de facto British fire engineering standard, PD-7974-7^{vii}. While nobody could reproach the researchers for using the only available standard, one could question the usefulness of loss data in 1966 currency and any conclusions drawn from it. Warehouses built before 1966 were

usually lower in height and smaller in area than those of today, often contained goods of lower specific value and were built very differently. Furthermore the standard does not indicate how to index the 1966 losses to today's currency: should one use the retail price index, London house prices, or some other arbitrary index? Using the retail price index, the researchers could not find an economic case to fit sprinklers in warehouses of any size, a conclusion which has astonished insurers. Doubling the losses per square metre yielded a threshold of 19,000m², which intriguingly is close to the new figure of 20,000m² in Approved Document B. Had the researchers doubled the loss figure again, the threshold would have come out below 1,000m². While not an exhaustive study, I have determined the value of goods per square meter in a few warehouses and using the same methodology found a threshold figure of 2,000m², above which there would be an economic case to fit sprinklers. None of the above discussion considers the losses due to business interruption, which can be substantial.

The good news is that while most of the UK lags behind the rest of Europe in requiring sprinklers in warehouses, Local Acts which cover a quarter of England and Wales do require sprinklers in warehouses, typically those larger than 7,000m³, to protect fire-fighters and property. Many in the fire safety community believe the remit of Approved Document B should also be extended to consider protection of the environment and our economy: sustainable buildings for sustainable communities. It is absurd that under the current regime a tyre warehouse fire which closes transport links and pollutes a river can be regarded as a success if nobody is hurt.

New Sprinklers for Warehouses

Although the sprinkler concept is old it is continually being refined, either to find ways to protect risks that could not previously be protected or to find more economic sprinkler solutions. Every year considerable sums are spent on research and

storage sprinkler systems have received among the most attention. Recently the industry has developed new solutions for the protection of high-piled storage, for the protection of refrigerated warehouses and for the protection of tyre storage.

In general the sprinklers used for storage applications can be divided into two broad groups: control mode sprinklers and suppression mode sprinklers. Control mode sprinklers are designed to limit the heat release rate of a fire to the level it was at when the sprinklers operated. They wet adjacent surfaces and cool the gases so that the ceiling structure is not weakened. The hydraulic characteristic of a sprinkler is defined by its k-factor. Multiply the k-factor by the square root of the pressure in bar and you have the flow rate through it. K-factors of control mode sprinklers now range from 80 to 240, in upright or pendent options. Generally designers prefer upright sprinklers in warehouses because they are protected by the pipe from damage.

The goods stored in a warehouse determine its hazard category and that in turn determines how much water per square meter, or the application density, the designer must apply for hydraulic calculations. In addition for higher hazard categories the standard requires the designer to assume a greater area of operation, or more sprinklers operating. To avoid excessive pressure requirements at the sprinkler the designer can use sprinklers with higher k-factors. It is in any case good practice to avoid high pressure at the sprinkler because it will then spray small water droplets which are carried away by the fire plume and do not penetrate down to the seat of the fire. The largest k-factor sprinklers have not been submitted to LPCB for approval but they do carry FM approval and UL listing. To obtain these approvals they were tested in full-scale fire tests and had to perform as well as the reference, approved, smaller k-factor sprinklers. They actually performed much better. For example, in a test with NFPA Group A plastics with a design application density of 24.3 mm/min, k-115 sprinklers controlled the fire but 29 sprinklers operated. By contrast k-160 sprinklers controlled the fire operating only 4 sprinklers. Ceiling temperatures peaked at 900°C with the k-115 sprinklers but at 300°C with the k-160 sprinklers.

At the request of end users, in recent years the sprinkler industry has introduced extended coverage control mode sprinklers. These have a k-factor of 360 and can protect 18.2m², or twice the area of other control mode storage sprinklers. That means that the designer can often save one-third of the branch lines, thus considerably reducing the cost of the installed system.

Unlike control mode sprinklers, which prevent an increase in the heat release rate from a fire, suppression mode sprinklers reduce the heat release rate. Suppression mode sprinkler systems are designed to operate fewer sprinklers but each sprinkler releases more water, with larger water droplets and at a higher downward velocity. The most common type of suppression mode sprinkler is the Early Suppression Fast Response, or ESFR sprinkler. These sprinklers suppress fires solely from the ceiling; saving the cost of fitting sprinklers between rack levels and removing the risk of water damage from in-rack sprinklers should a forklift truck driver hit one. ESFR sprinklers range in k-factor from 200 to 360. Most are approved by



Pic courtesy of European Fire Sprinkler Network

LPCB, with the larger k-factor ESFR sprinklers being able to protect one more level of racks than the others.

Last year two manufacturers introduced new concepts for the protection of refrigerated warehouses. One uses ESFR sprinklers with a special anti-freeze, the other a dry pipe system calculated to release water within 30 seconds.

At the request of the tyre industry, the same two sprinkler manufacturers developed new sprinkler designs which use low expansion foam to protect tyres stored in racks. These systems use much less water than water-only systems, saving on pump, tank, piping and any water retention system costs.

Storage sprinkler systems offer more alternative designs than any other application. With careful selection of the design concept and sprinklers the designer can achieve significant savings against the usual approach with sprinklers that have been on the market for decades. While warehouse fires cause relatively few fire deaths and injuries, they often lead to large property losses and disruption to businesses, harming communities with the loss, sometimes permanent, of a major local employer. Fire-fighters agree that an uncontrolled warehouse fire is one of the most dangerous scenarios they are likely to face. For all these reasons, many European countries now insist that sprinklers be fitted in large warehouses. It is time the UK joined them. **APF**

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CHINA

KIDDE CHINA

Product Support & Sales Office, 21/F Tower 2
88 Container Port Road, Hong Kong
Contact: Martin Dowson (General Manager)
Tel: 00 852 2334 2388
Fax: 00 852 2370 8381
Email: general@kidde-china.com
Fax: 03 9518 5577
Email: info@angusfire.com.au
Website: www.angusfire.com.au
Representative Office

HONG KONG

CENTURION FIRE FIGHTING CO

Room A, 13th Floor
Go-Up Commercial Building
998, Canton Road, Mongkok, Kowloon
Contact: Johnny Yuen (Manager)
Tel: (00 852) 2332 7071
Fax: (00 852) 2332 6145
Email: johnny@centurionfire.com.hk
Dealer/Distributor

INDIA

KIDDE INDIA LIMITED

EL 205, TTC Industrial Area
Mahape, Navi Mumbai, 400 710, India
Tel: +91 22 67800100
Fax: +91 22 27618444
Email: info@kiddeindia.com
Website: www.kiddeindia.com
Representative Office

INDONESIA

PT RANTAI LAUT

Jl Kemang Raya No. 11
Jakarta Selatan
Contact: Jimmy Singh
Tel: (00 62) 21 717 90122
Fax: (00 62) 21 717 90607
Website: www.rantai-laut.com
Email: jimmy@rantai-laut.com
Dealer/Distributor

JAPAN

OWEN LTD

2-5-20 Gokou-Nishi
Matsudo-Shi Chiba T270-2218
Contact: Mr Masao Oyake (Managing Director)
Tel: (00 81) 47 389 5510
Fax: (00 81) 47 385 1763
Email: owen@msi.biglobe.ne.jp
Dealer/Distributor

KOREA (SOUTH)

INDECO CORPORATION

814 Daewoo
The-O-Plus Building
1142-2 Sanbondong Gunposi
Kyunggi-do
Korea 435-040
Contact: Thomas Park (President)
Tel: (00 82) 31 390 6911/2
Fax: (00 82) 31 390 6913
Email: thomas@esafety.co.kr
Mobile: (00 82) 11 726 2248
Dealer/Distributor

MACAU

CENTURION FIRE FIGHTING CO

Room A, 13th Floor
Go-Up Commercial Building
998, Canton Road
Mongkok, Kowloon
Contact: Johnny Yuen (Manager)
Tel: (00 852) 2332 7071
Fax: (00 852) 2332 6145
Email: johnny@centurionfire.com.hk
Dealer/Distributor

MALAYSIA

KINSAJASA SDN BHD

1st Floor, 2298 Pujut 5 Shoplot
98000 Miri
Sarawak
East Malaysia
Contact: Roger Ling
(Mobile: 6019 855 0360)
Tel: 6085 665802 or 660423
Fax: 6085 655803 or 655402
Email: kinsar@tm.net.my or
ksajaservice@mvjaring.net
Dealer/Distributor

NEW ZEALAND

KIDDE AUSTRALIA PTY LTD

Street Address:
314 Boundary Road, Dingley Vic 3172
Mailing Address:
PO Box 682, Braeside Vic 3195
Freecall (Australia): 1800 672 171
Tel: 03 9518 5588
Fax: 03 9518 5577
Email: info@angusfire.com.au
Website: www.angusfire.com.au
Representative Office

PAPUA NEW GUINEA

KIDDE AUSTRALIA PTY LTD

Street Address:
314 Boundary Road, Dingley Vic 3172
Mailing Address:
PO Box 682, Braeside Vic 3195
Freecall (Australia): 1800 672 171
Tel: 03 9518 5588
Fax: 03 9518 5577
Email: info@angusfire.com.au
Website: www.angusfire.com.au
Representative Office

PHILIPPINES

ALARM SYSTEMS CORP

Unit 3205, Summit-1
Office Tower
530 Shaw Road
Mandaluyong City
Contact: Allen Lim
Tel: (00 632) 532 0556
Fax: (00 632) 533 6476
Email: mail@alarmsystems.com.ph
Dealer/Distributor

SINGAPORE

KIDDE ASIA FIRE & SECURITY PTE LTD

438 Alexandra Road
17-01 & 04 Alexandra Point
Singapore 119958
Contact: Bob Graham (Sales Manager,
Fire Fighting Products)
Dir Tel: (00 65) 6424 7938
Mobile: (00 65) 9671 1567
Tel: (00 65) 6424 7979
Fax: (00 65) 6424 7978
Website: www.kiddeasia.com
Email: bob.graham@kidde-asia.com.sg
Representative Office

TAIWAN**SENSOR LTD**

No. 8-1, Rueiguang Road, Neihu Chiu
Taipai, Taiwan 114
Contact: Alex Jeng
Tel: (00 886) 2 8792 9881
Fax: (00 886) 2 8792 9885
Email: sensor.fire@msa.hinet.net
Website: www.sensorfire.com
Email: alex@sensorfire.com
Dealer/Distributor

THAILAND**AB GROUP**

Contact: Phairot Bulpakdi (Managing Director)
42 Soi Ngam Duplee, Sathorn, Bangkok 10120
Tel: (00 66) 2 2871570
Fax: (00 66) 2 2871460
Dealer/Distributor

ANSUL INCORPORATED

INDONESIA**ANSUL INCORPORATED**

Bangun Tjipta Bldg, Level 3B
Ji Jend Gatot Subroto No. 54
Jakarta 10260, Indonesia
Tel: 62 21 536 77662
Fax: 62 21 536 77663
Representative Office

BAUER COMPRESSORS

BRUNEI**BAUER COMPRESSORS ASIA PTE LTD**

2 Alexandra Road
#01-03A Delta House, Singapore 159919
Singapore
Tel: +65 6271 6271
Fax: +65 6272 3345
Email: info@bauer-compressors.com.sg
Representative Office

CHINA**BAUER KOMPRESSOREN CHINA LTD**

707 Block A, M.P. Industrial Centre
18 Ka Yip Street, Chai Wan
Hong Kong S.A.R
Tel: +852 2595 1898
Fax: +852 2595 0878
Email: bkc@bauerchina.com
Representative Office

INDIA**ALLIED SOLUTIONS PVT LTD**

313/314, Raikar Chambers,
Govandi [East], Mumbai – 400 088
Tel: 022 6797 8056 / 57 / 58
Fax: 022 2557 6234
Email: kini@alliedsolutions.com
Dealer/Distributor

**MOUNT EVEREST ENGINEERING
COMPANY**

A-103 Gokul Arcade, Sahar Road
Vile Parle (East) Mumbai 400 057, India
Tel: +91 (22)8202558
Fax: +91 (22)8205792
Dealer/Distributor

INDONESIA**MARINE & INDUSTRIAL
COMPRESSORS**

304 Thomson Road, Singapore 307654
Tel: +65 6250 6018
Fax: +65 6253 8443
Email: masmarin@singnet.com.sg
Dealer/Distributor

JAPAN**BAUER COMPRESSORS CO. LTD**

10-36 Ryutsu-center, Kitakami-shi Iwate-ken
024-0014 Japan
Tel: +81 0197 68 2251
Fax: +81 0197 68 2225
Representative Office

KOREA (SOUTH)**TECKO CO LTD**

S.K Technopark
Mega Center Room 201/202
190-1 Sangdeawong 1-Dong
Jungwon-gu, Sungnam-city, Kyungki-do, Korea
Zip 462-705
Tel: +82 2 3461 3000-3 and +82 31 776 2442
Fax: +82 2 529 4240 and +82 31 776 2444
Dealer/Distributor

MALAYSIA**SK CRYOGENICS SDN BHD**

No 5, Jalan TP 7/6
Sime U.E.P. Industrial Park
Section 26 40400 Shah Alam, Selangor, Malaysia
Tel: +60 3 5192 4269/70
Fax: +60 3 5192 4235
Dealer/Distributor

PAKISTAN**ALPINE INDUSTRIALCON (PVT) LTD**

305/2 G.T. Road
Baghbanpura, Lahore, Pakistan
Tel: +92- 42- 685 2313
Fax: +92- 42-367 4655
Email: alpinelashore@hotmail.com
Dealer/Distributor

PHILIPPINES**CEBU ERNBRI IMPORT,
INC/AQUAVENTURE WHITETIP DIVE
SUPPLY**

Ermita Office:
Unit 101 Joncor II Bldg
#1362 A.Mabini Street
Ermita Manila
Philippines 1000, Philippines
Tel: +632 521-0433
Fax: +632 522-1165
Website: www.aquaventurewhitetip.com
Dealer/Distributor

SINGAPORE**BAUER COMPRESSORS ASIA PTE LTD**

2 Alexandra Road
#01-03A Delta House
Singapore 159919
Singapore
Tel: +65 6271 6271
Fax: +65 6272 3345
Email: info@bauer-compressors.com.sg
Representative Office

**MARINE & INDUSTRIAL
COMPRESSORS**

304 Thomson Road
Singapore 307654
Tel: +65 6250 6018
Fax: +65 6253 8443
Email: masmarin@singnet.com.sg
Dealer/Distributor

TAIWAN**MING SHEN ENTERPRISE CO LTD**

5, PaShih 1 street
DanShui Town, Taipei
Taiwan 25170
Taiwan (Republic of China)
Tel: +886 (2) 28095789
Fax: +886 (2) 28096189
Email: www.bauer-kompressoren.de/
sales/bcmail_en.php?id=233>
Website: www.3arrow.com.tw
Dealer/Distributor

THAILAND**INTERSOL ENGINEERING &
TECHNOLOGY PTE LTD**

160 Rimklongprapa Road
Bangsue Bangkok 10800
Thailand
Tel: +66 2 9106 445
Fax: +66 2 9106 446
Email: www.bauer-kompressoren.de/
sales/bcmail_en.php?id=235>
Dealer/Distributor

VIETNAM**MEKONG SCUBA SUPPLY LTD**

Saigon Tower
29 Le Duan Blvd
Suite 1600
Ho Chi Minh City
Vietnam
Tel: +848 823 6294
Fax: +848 823 6288
Email: mikedoyle44@hotmail.com
Dealer/Distributor

BRISTOL UNIFORMS

BANGLADESH**MANIK BROTHERS**

Hai Mansion (3rd Floor)
9/3 Motijheel Circular Road
Dhaka – 1000
Bangladesh
Contact: Mr A K Bhowmick
Tel: +880 2 7100 589
Fax: +880 2 7100 386
Email: manikbrs@1postbox.com
Dealer/Distributor

BRUNEI**DASAPREM (M) SDN BHD**

10 & 12 Jalan Muara 8/9
40000 Shah Alam
Selangor Darul Ehsan
Malaysia
Contact: Mr Prem R Murthy
Tel: +603 550 9060
Fax: +603 550 4486
Email: dasaprem@yahoo.com
Website: www.dasaprem.com
Dealer/Distributor

CHINA**SHENZHEN RUFN INDUSTRIAL CO LTD**

RM-701 7/F Leaser Tower
1st Fuhua Rd
Shenzhen, China
Contact: Amy Jin
Tel: +86 755 8399 9581
Fax: +86 755 8399 9548
Email: wj@rufn88.com
Dealer/Distributor

FIJI**PHILLIPS & SMITH LIMITED**

10 Akatea Road
Glendene
Auckland
New Zealand
Contact: Mr S Hampton
Tel: +649 818 8048
Fax: +649 818 4484
Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
Dealer/Distributor

HONG KONG**CHUBB HONG KONG LIMITED**

3 Hok Yuen Street East
Hung Hom
Kowloon
Hong Kong
Tel: +852 2746 9628
Fax: +852 2785 0849
Dealer/Distributor

INDIA**FOREMOST MARKETING PVT LTD**

M-1 Green Park Extn, New Delhi 110016, India
 Contact: Mr Vinay Khanna
 Tel: +91 11 261 969 82
 Fax: +91 11 261 669 61
 Email: foremost@vsnl.net
 Website: www.foremostsafety.com
Dealer/Distributor

MALAYSIA**DASAPREM (M) SDN BHD**

10 & 12 Jalan Muara 8/9, 40000 Shah Alam
 Selangor Darul Ehsan, Malaysia
 Contact: Mr Prem R Murthy
 Tel: +603 550 9060
 Fax: +603 550 4486
 Email: dasaprem@yahoo.com
 Website: www.dasaprem.com
Dealer/Distributor

NEW ZEALAND**PHILLIPS & SMITH LIMITED**

10 Akatea Road, Glendene,
 Auckland, New Zealand
 Contact: Mr S Hampton
 Tel: +649 818 8048
 Fax: +649 818 4484
 Email: stuart@firemaster.co.nz
 Website: www.firemaster.co.nz
Dealer/Distributor

SINGAPORE**YEN LEE FIREWELD PTE LIMITED**

18 Penhas Road, 208182, Singapore
 Contact: Mr Don Tay
 Tel: +65 62909890
 Fax: +65 62961444
 Email: don@fireweld.com.sg
 Website: www.fireweld.com.sg
Dealer/Distributor

TAIWAN**SHENG-TAI FIRE PROTECTION INDUSTRIAL CO LTD**

No 222-2 Sec2, Cheng Tai Rd
 Wu-Ku Shiang, Taipei, Hsien, Taiwan
 Contact: Liu Yuan Hung
 Tel: +886 22292 1751
 Fax: +886 22291 1984
 Email: sato@mail.mold.net.tw
 Website: www.shengtai.com.tw
Dealer/Distributor

DRAEGER SAFETY**AUSTRALIA****DRAEGER SAFETY PACIFIC PTE LTD**

Axxess Corporate Park, Unit 99, 45 Gilby Road
 Mount Waverley Victoria 3149
 Tel: +61 3 9265 5000
 Fax: +61 3 9265 5095
 Email: customer.service@draeger.com
Representative Office

CHINA**BEIJING FORTUNE DRAEGER SAFETY EQUIPMENT CO LTD**

Yu An Lu 22, B Area
 Beijing Tianzhu Airport Industrial Zone, Shunyi
 District, Beijing, 101300
 Tel: +86 10 8049 8000
 Fax: +86 10 8049 8005
 Email: Peter.wang@draeger.com
Dealer/Distributor

INDIA**JOSEPH LESLIE DRAEGER MFG PVT LTD**

Leslico House, Dadar (W), Mumbai – 400 028, India
 Contact: Prof. V.S Agashe Marg
 Tel: +91 22 2422 7587/1880
 Fax: +91 22 2430 3705
 Email: mumbai@lesliedraeger.com
Dealer/Distributor

INDONESIA**PT DRAEGERINDO JAYA**

Jl. Pangeran Antasari No. 67
 Cilandak Barat Unit L, Jakarta Selatan 12430
 Tel: +6221 751 3289
 Fax: +6221 751 2052
 Email: product_support@draeger.co.id
Dealer/Distributor

JAPAN**DRAEGER SAFETY JAPAN LTD**

3-8-1 Tokyo, Koto-ku
 Tokyo 135 0016
 Tel: +81 3 44 615111
 Fax: +81 3 44 615100
 Email: yukata.kataoka@draeger.co.jp
Representative Office

KOREA**DRAEGER SAFETY ASIA**

Daejong Bld. #1106, Bang-l-dong,
 Songpa gu, Seoul, Korea
 Tel: +82 2 6415 8222
 Fax: +82 2 6415 8223
 Email: sdseo3@magincn.com
Representative Office

MALAYSIA**DRAEGER SAFETY ASIA PTE LTD**

14 Jalan PJS 11/18
 Sunway Technology Park
 46150 Petaling Jaya, Selangor
 Tel: +60 3 5635 6460
 Fax: +60 3 5635 4171
 Email: dsa.malaysia@draeger.com
Representative Office

NEW ZEALAND**DRAEGER SAFETY PACIFIC PTE LTD**

Unit O, No. 150, Harris Road
 East Tamaki, Auckland
 Tel: +649 273 3160
 Fax: +649 273 3159
 Email: geert.herder@draeger.com
Representative Office

TAIWAN**DRAEGER SAFETY TAIWAN CO LTD**

12/F, Kuohwa Building, 868-5 Chungcheng Rd
 Chunggho City, Taipei county 235
 Tel: +886 (02) 2223-6388
 Fax: +886 (02) 2223-2258
 Email: sales.taiwan@draeger.com
Representative Office

THAILAND**DRAEGER SAFETY (THAILAND) LTD**

123/20, Nonsi Road, Kwaeng Chongnonsi
 Khet Yannawa, Bangkok 10120
 Tel: +662 6811 781 (4 lines)
 Fax: +662 6811 780
 Email: sales.thailand@draeger.com
Representative Office

VIETNAM**DRAEGER SAFETY ASIA**

4th Floor, Vinatex Building
 25 BA Trieu Street, Hanoi
 Tel: +84 4 936 437 / 48
 Fax: +84 4 936 4349
 Email: thu.huong@draeger.com
Representative Office

E2V TECHNOLOGIES**INDIA****FOREMOST MARKETING PVT LTD**

M-1, Green Park Extn
 New Delhi 1100016, India
 Tel: 00 91-11-261-96982
 Fax: 00 91-11-261-66961
 Email: foremost@vsnl.net
 Website: www.foremostsafety.com
Dealer/Distributor

JAPAN**CORNES DODWELL LTD (OSAKA)**

13-40 Nishihonmachi 1-chome, Nishi-ku
 Osaka 550-0005, Japan
 Tel: + 81-6-6532-1012
 Fax: + 81-6-6532-7749
 Email: e-device@cornes-dodwell.co.jp
 Website: www.cornes-dodwell.co.jp
Dealer/Distributor

KOREA (SOUTH)**GODO ENGINEERING CO LTD**

1FL. 142-5 Yeonhee-2
 Dong Soedaemun-Gu, Seoul, Korea, 120-112
 Tel: 822-3141-1236
 Fax: 822-3141-1270
 Email: info@godoeng.com
 Website: www.godoeng.com
Dealer/Distributor

ELKHART BRASS**AUSTRALIA****FIRE RESPONSE PTY LTD**

71 Prince William Dr, P.O. Box 668, Seven Hills
 2147, Australia
 Tel: +61 2 9838 9071
Dealer/Distributor

INDONESIA**PT REJECKI UTAMA**

Wisma Geha, 5th Floor, JL Timor 25
 Jakarta, Indonesia
 Tel: +62 21 316 2779
Dealer/Distributor

NEW ZEALAND**PSL PHILLIPS & SMITH LTD**

P.O. Box 69-028
 Glendene, Auckland, New Zealand
 Tel: +64 9 8184484
Dealer/Distributor

THAILAND**GUARDFIRE LIMITED**

42/2 Teo Hong Bangna Building
 Moo 10,
 Bangna-Trad Road
 Bangkok 10260, Thailand
 Tel: +66 2 7467031
Dealer/Distributor

FIRE FIGHTING ENTERPRISES**AUSTRALIA****AMPAC INDUSTRIES PTY LTD**

97 Walters Drive
 Osbourne Park
 Western Australia 6017
 Tel: 00 61 892 423 333
 Fax: 00 61 892 423 334
Dealer/Distributor

HONG KONG**HLK SERVICES LTD**

Room 1111, Tower B
 Hung Hom Commercial Centre
 39 Ma Tau Wai Road
 Hung Hom, Kowloon, Hong Kong
 Tel: 00 852 23303083
 Fax: 00 852 23656128
Dealer/Distributor

INDIA**NITIN FIRE PROTECTION INDUSTRIES LTD**

501, Delta, Technology St.
 Hiranandani Gardens,
 Powai, Mumbai -400 076, India
 Tel: 00 91 22 25700392
 Fax: 00 91 22 25701110
Dealer/Distributor

KOREA (SOUTH)**HI MAX CO LTD**

Sicox Tower 115-Ho 513-14, Sangdaewon-Dong
Jungwon-Gu, Sungnam-City, Kyungki Do, Korea
Tel: 00 82 31 769 7698
E-Mail: khkim@himax119.co.kr

Dealer/Distributor**MALAYSIA****FITTERS ENG.SERVS SDN BHD**

No.1 Block C, Jalan Dataran Sd1 Pju 9, 52200
Bandar Sri, Damansara, Kuala Lumpur, Malaysia
Tel: 00 60 3 62767155
Fax: 00 60 3 62758712

Dealer/Distributor**NEW ZEALAND****AMPAC INDUSTRIES LIMITED**

P.O. Box 100-149, North Shore Mail Centre
Glenfield, Auckland, New Zealand
Tel: 00 64 94438072
Fax: 00 64 94438073

Dealer/Distributor**SINGAPORE****ACCLAIM SYSTEMS PTE LTD**

Blk 104 Boon Keng Road, 05-01
Singapore 339775
Tel: 00 656 2990 798
Fax: 00 656 299 3735

Dealer/Distributor**ALARM SUPPLY PTE LTD**

63 Jalan Pemimpin, 03-07 Pemimpin Industrial
Building, Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428

Dealer/Distributor**TAIWAN****HORING LIH IND CO LTD**

4F No 18 Lane 327, Chung Shan Road
Sec 2 Chung-Ho-City, Taipei Hsien, Taiwan
Tel: 00886 2224 87599
Fax: 00886 2224 07752
Email: ahtaipei@me26.hinet.net

Dealer/Distributor**THAILAND****F.B. (THAILAND) LTD**

75 Soi Rubia, Sukhumvit 42 Road
Bangkok 10110, Thailand
Tel: 00 66 2 3902445
Fax: 00 66 2 3811197

Dealer/Distributor**TEEYA MASTER SYSTS CO LTD**

100/101-102 Vongvanji, Building B, 30Th Flr,
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
Tel: 00 662 2 6451130
Fax: 00 662 2 2488540

Dealer/Distributor**HELMET INTEGRATED SYSTEMS****AUSTRALIA****CHUBB FIRE AUSTRALIA**

120 Silverwater Road, Silverwater
NSW 2118, Australia
Tel: +61 2 8748 7440
Email: Graham_Harris@chubb.com.au

Dealer/Distributor**BRUNEI****GLAMCO AVIATION (B) SDN BHD**

GPO Box 2793, Bandar Seri Begawan
Brunei BS 8675
Tel: +673 2 451757
Email: shran@brunet.bn

Dealer/Distributor**CHINA****WUXI FIRETRE SAFETECH**

No 8, 2nd Floor
Xian Li Road
WUXI, Jiangsu Province 214021
People's Republic of China
Tel: +86 510 275 3771
Email: gao@pub.wx.jsinfo.net

Dealer/Distributor**HONG KONG****SAFETECH LIMITED**

Block C Unit 11, 11th Floor
Wah Lock Industrial Centre
Shan Mai Street
Fo Tan Shatin, New Territories, Hong Kong

Dealer/Distributor**INDIA****VIJAY SABRE SAFETY PVT LTD**

Plot 35 Chandivali Village
Off Saki Vihar Rd
Mumbai 400 072, India
Tel: +91 22 28475488
Email: vijaysabre@vsnl.net

Dealer/Distributor**INDONESIA****PT BUMI CERAH AGUNG**

Komplex Karang
Anyar Permai
Jl Karang Anyar No 55 /C1-17
Jakarta 10740, Indonesia
Tel: +62 21 6246954
Email: rudybca@centrin.net.id

Dealer/Distributor**KOREA (SOUTH)****JIN-ASIA CORPORATION**

889-3 Daedae-Ri
Unghon Myun
Ulzoo-Kun, Ulsan City
South Korea
Tel: +82 52 221 9871
Email: jinasia@nownuri.net

Dealer/Distributor**MALAYSIA****DASAPREM (M) SDN BHD**

10 & 12 Jalan Muara 8/9
4000 Shah Alam, Selangor
Darul Ehsan, Malaysia
Tel: +60 (3) 551 00957
Email: dasaprem@dasaprem.com

Dealer/Distributor**NEW ZEALAND****CHUBB FIRE & SAFETY PRODUCTS**

3 Fisher Crescent, Mt Wellington
Private Bag 9220
Auckland, New Zealand
Tel: +64 9 270 7234
Email: Daryl_Brown@chubb.co.nz

Dealer/Distributor**SINGAPORE****PROGRESSIVE INDUSTRIAL EQUIPMENT COMPANY**

24 New Industrial Rd
#02-08 Pei Fu Building
Singapore 536210
Tel: +65 6282 7722
Email: pie@pacific.net.sg

Dealer/Distributor**PHILIPPINES****ALLIANCE INDUSTRIAL SALES**

Unit 109, Cluster 3
Makati Prime City
7708 St Paul Road San Antonio
1203 Makati City, Philippines
Tel: +632 890 8818
Email: alliance8_jcy@pacific.net.ph

Dealer/Distributor**TAIWAN****SECOROC CORPORATION**

219 Chung Cheng North Road
San Chung City, Taipei Hsien, Taiwan
Tel: +88 2 8985 3838
Email: secoroc@ms21.hinet.net

Dealer/Distributor**THAILAND****CHASE ENTERPRISE (SIAM) CO LTD**

497 Phrapinklao Road, PO Box 7-67
Bangyeeekhan, Bangplad
Bangkok 10700, Thailand
Tel: +66 2 883 2880
Email: chase@loxinfo.co.th

Dealer/Distributor**KERR****AUSTRALIA****FIRE RESPONSE PTY LTD**

PO Box 668, New South Wales 1730,
Seven Hills, Australia
Contact: Geoff Marchant
Tel: 0061 02 9838 9044
Fax: 0061 02 9838 9071
Email: firemail@firerresponse.com.au

Dealer/Distributor**HONG KONG****ON MAN SAFETY EQUIPMENT CO**

6/F Block F1
Hong Kong Industrial Building
444-452 Des Voeux Road, West Hong Kong
Contact: Micheal Lui
Tel: 00852 254 72658
Fax: 00852 254 72674
Email: miclui@ctimail3.com

Dealer/Distributor**INDIA****NITIN FIRE PROTECTION INDUSTRIES LIMITED**

501, Delta, Technology Street
Hiranandani Gardens, Powai
Mumbai 400-076, India
Contact: Vijay Shelar
Tel: 0091 22 2570 0392
Fax: 0091 22 2570 1110
Email: shelarv@nitinfire.com

Dealer/Distributor**MALAYSIA****DASAPREM (M) SDN BHD**

10 & 12 Jalan Muara 8/9, 40 000 Shah Alam
Selangor Darul Ehsan, Malaysia
Contact: T.D. Murthy
Tel: 00603 5510 0957
Fax: 00603 5510 4486
Email: dasaprem@yahoo.com
Website: www.dasaprem.com

Dealer/Distributor**NEW ZEALAND****PSL**

PO Box 69-028, 10 Akatea Road
Glendene, Auckland, New Zealand
Contact: Anne Hadfield
Tel: 0064 9 818 8048
Fax: 0064 9 818 4484
Email: anne@firemaster.co.nz

Dealer/Distributor**THAILAND****THE EAST ASIATIC (THAILAND) PUBLIC CO LTD – EAC**

1168/98-100 Lumpini Tower
33rd Floor, Rama IV Road, Kwang Thungmahamek
Khet, Sathorn Bangkok 10120, Thailand
Contact: Patcharaporn S.
Tel: 0066 2689 5999
Fax: 0066 2689 5888
Email: patcharaporn@eac.co.th

Dealer/Distributor

KIDDE FIRE PROTECTION

AUSTRALIA

KIDDE AUSTRALIA PTY LTD

Street Address:
314 Boundary Road
Dingley Vic 3172
Mailing Address:
PO Box 682
Braeside Vic 3195
Freecall (Australia): 1800 672 171
Tel: 03 9518 5588
Fax: 03 9518 5577
Email: info@angusfire.com.au
Website: www.angusfire.com.au
Representative Office

BRUNEI

KIDDE ASIA FIRE & SECURITY PTE LTD

438 Alexandra Road
17-01 & 04 Alexandra Point
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MSA (AUST.) PTE LTD

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Dealer/Distributor

BANGLADESH

ENGINEERING & ARCHITECTURAL CONSULTANTS LTD

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INDIA**CORE ENERGY SYSTEMS PVT LTD**

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Tel: +66 75 637926
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Email: glyn@onestopdive.com
Website: www.onestopdive.com
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HONG KONG**NOTIFIER HONG KONG**

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INDIA**NOTIFIER INDIA**

Mumbai, India
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Bangalore, Calcutta, Gurgaon

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TAIWAN**NOTIFIER TAIWAN**

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PBI PERFORMANCE PRODUCTS

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WAH TAI ENTERPRISES

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PPS LTD

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OPEC SYSTEMS PTY LTD

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Seoul, 110-817, Korea
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Email: boss.motor@msa.hinet.net
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SAGE TECHNOLOGIES**JAPAN****COMTEC COMPANY**

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SOLBERG SCANDINAVIA AS**AUSTRALIA****SOLBERG ASIA PACIFIC PTY LTD**

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CHINA**SHANGHAI JINDE INDUSTRY DEVELOPMENT CO LTD**

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UNIVERSAL CARS LIMITED

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ADVERTISERS' INDEX

Amkus Inc	60
Angus Fire	30
Ansul, Inc.	OBC
Bauer Compressors Asia Pte Ltd.	57
Bio-Ex	23
Bristol Uniforms Ltd.	19
Control Logic s.r.l.	38
Dafo Fomtec	29
Draeger Safety Asia Pte Ltd.	54
Dr. Sthamer Hamburg	33
DuPont FE	04
DuPont Surface Protection Solutions	25
E2V Technologies	58
Elkhart Brass Mfg Co Inc	47
Fire Fighting Enterprises	41
GB Solo Ltd.	06
Helmet Integrated Systems Ltd.	18
Holmatro Rescue Equipment	62
Honeywell Fire Systems	53
Lancier Hydraulik Co. KG	67
L&W Compressors + Systems Pte Ltd.	56
NFPA	63
Nittan UK Ltd.	43
Pacific Helmets Australia Pty Ltd	14
PBI Performance Products	37
Plastika Akrapovic	20
PPS Ltd.	23
Resqtec Zumro Asia Sdn Bhd	61
Sage Technologies Ltd.	32
Securiton AG	53
Sicor Spa	17
Solberg Scandinavian	23
Task Force Tips, Inc.	IFC & 44
Texas A & M Emergency Services Training Institute	41
Tyco Safety Products – Skum	27
Unifire Power Blowers	IBC
Vetrotech Saint Gobain International AG	35
Waterous Company	49

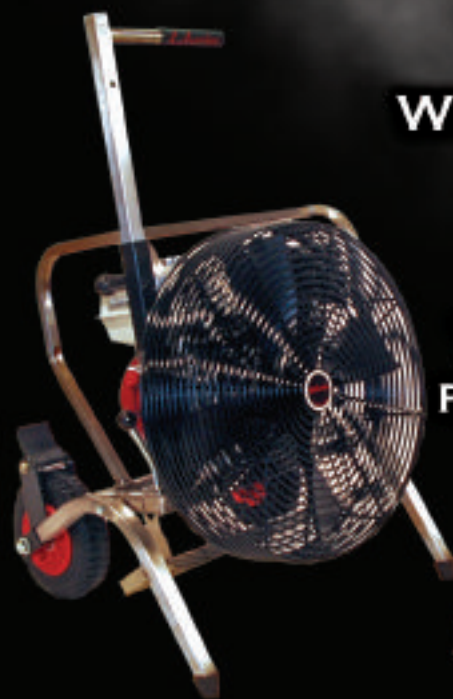
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